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A
S Y S T E M
OF
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BY
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VOLUME II.

SECOND AMERICAN, FROM THE SEVENTH EDINBURGH EDITION,

CORRECTED AND ENLARGED.

TROY, NEW-YORK:

PRINTED BY O. PENNIMAN AND CO.

FOR THEMSELVES; THOMAS AND ANDREWS, BOSTON; T. S. ARDEN,
NEW-YORK; AND J. CONRAD AND CO. PHILADELPHIA.

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1804.

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CHAPTER VIII.
O F B L O O D L E T T I N G.

SECTION VII.

Of Bloodletting in the Ankles and Feet.

WHAT has already been said on the operation of bloodletting, renders it unnecessary in this place to be minute. When blood is to be taken from the veins of these parts, it will be readily understood, that our first object should be to compress the veins, so as to produce an accumulation of their contents. The ligature being applied sufficiently tight a little above the ankle joint, all the branches of the vena saphæna, both in the inside and outside of the foot, come at once into view; and as this vein is every where superficial, being in general covered with skin only, wherever it appears conspicuously, it may with safety be opened.

With a view to encourage the discharge of blood, it has been a constant practice in opening these veins, to immerse the feet in warm water immediately on the orifice being made. But this is a very inaccurate method, as the quantity of blood taken in this manner can never be ascertained, from being all mixed with the water: neither is the assistance of warm water necessary; for when all the veins are sufficiently compressed, and the orifice of a proper size, I never find more difficulty in obtaining a full discharge of blood from these veins, than from those in other parts of the body.

On removing the ligature, however, the blood stops easily; so that a piece of adhesive plaster applied over the orifice, answers all the purposes of a bandage.

These are the several parts from whence blood is usually taken by venesection; but in some instances, where the contiguous parts have been particularly affected, it has been judged advisable to open the veins of other parts, as those of the tongue, of the penis, the eye, and the external hemorrhoidal veins. When blood is to be discharged in this manner from the penis, the veins can be easily brought into view by pressure with a ligature; but, in the tongue, in the hemorrhoidal veins about the anus, and other parts where compression cannot be applied, all that can be done, is, to make an orifice of a proper size in the most conspicuous part of the vein; and if a sufficient discharge cannot in this manner be obtained, it may be necessary in such circumstances to put the parts in warm water; and, for some time, to keep them immersed in it.

Having thus considered the various modes of discharging blood by venesection, we now proceed to arteriotomy.

SECTION VIII.

Of Arteriotomy.

WHATEVER advantages may in theory have been expected from arteriotomy, and however keenly some may in their closets have given it their support, not only as being in many instances preferable to venesection, but as an operation perfectly safe; yet the most strenuous friends to the practice have shrunk from attempting it on large arteries. Instances, indeed, have occurred of large arteries being opened, and no dangerous consequences taking place; but they are so exceedingly rare, that no practitioner of experience will be induced by them, deliberately, or from choice, to adopt the practice. The smaller branches of arteries may indeed be opened with safety when not deeply covered, and especially when they lie contiguous to bones; for in these situations, as soon as the quantity intended to be taken is discharged, all farther loss of blood may be prevented by compression; but the opening of any of the larger arteries must be always attended with so much hazard, and the advantages to be expected from it in preference to venesection are apparently so trifling, as must probably prevent it from ever becoming general.

We know of few arteries, therefore, which with propriety can be opened: the different branches of the temporal are those indeed from whence blood in ordinary practice is ever taken; but, if a fanciful practitioner should at any time incline to take blood in this manner from a different part, it may be done with safety from one of the arteries running on each side of the fingers. About the middle of the last phalanx, this artery is sufficiently large for discharging a considerable quantity of blood; in most cases it lies su-

perforated, and in this situation there can seldom be much difficulty in putting a stop to the discharge: in performing this operation on any of the temporal branches, if the artery is superficial, it may be done with one push of the lancet, in the same manner as in venesection; but, when the artery is deeply covered, it should be previously brought into view, by cutting the skin before making the orifice with the lancet: for when the smaller arteries are cut entirely across, they never bleed freely, from their being apt to retract more or less within the surrounding parts.

Some nicety is therefore necessary in making the opening into the artery: it should neither be quite across, nor directly longitudinal; for it never bleeds so freely, either in an artery or vein, when quite longitudinal, as when somewhat oblique.

When the opening is properly made, and the artery of a moderate size, it will at once discharge freely, without being compressed; but the discharge may be increased at pleasure, by compressing the artery immediately above the orifice, between it and the corresponding veins. The quantity of blood being thus discharged, a very slight compression on these smaller arteries will suffice for putting a stop to the evacuation: for the most part, any pressure that is necessary may be applied here as in venesection, by means of a linen compress and roller: the orifice being first entirely cleared of blood, and properly covered with adhesive plaster. If this should not prove sufficient, a compress of linen should be applied over it, and the whole secured with a roller.

In some instances even this does not succeed, and the orifice continues to burst out from time to time, so as to produce much inconvenience and distress.

In this situation we have different methods of putting a stop to the discharge. 1st, If the artery is small, as all the branches of the temporal arteries commonly are, cutting it entirely across, exactly at the orifice made with the lancet, by allowing it to retract within

the surrounding parts, for the most part proves sufficient. 2d, When the patient does not consent to this, we have it always in our power to secure the bleeding vessel with a ligature, as would be done with an artery accidentally divided in any part of the body. And lastly, when the patient will not consent to either of these, we may, by regular continued pressure, obliterate the cavity of the artery at the point where the opening was made, and thus produce an accretion of its sides. Different bandages have been contrived for compressing the temporal artery; but none of them answer the purpose so well as the one represented in Plate LXIV. fig. 3.

As some time, however, is required to obliterate the cavity of an artery, this method is accordingly more tedious: but with timid patients it proves more acceptable than either of the other two.

Having thus considered the various means employed for evacuating blood from the larger arteries and veins, we now proceed to the consideration of topical bloodletting,

SECTION IX.

Of Topical Bloodletting.

WHEN, either from the severity of local inflammation, or from any other cause, we wish to take blood directly from the vessels of the part affected, the following are the different methods we employ for it. The application of leeches; scarifications with a lancet, or some other sharp instrument; and, lastly, by means of an instrument termed a scarificator, containing from one to twenty lancets, or more: in this instrument, Plate VII. fig. 1. the lancets are fixed in such a manner, that when applied to the part from

whence we wish to take blood, the whole number are driven suddenly into it, by means of a spring, and to a greater or lesser depth, at pleasure. This being done, as it is the smaller blood vessels only that by this operation are ever meant to be cut, and as these seldom bleed freely, different means are employed for promoting the discharge.

Various methods have been proposed for this. Glasses fitted to the form of the parts, with a small hole in the bottom of each, were long ago contrived; and these being placed upon the scarified parts, a degree of suction was produced by a person's mouth, sufficient for nearly exhausting the air contained in them.* This accordingly was a very certain method of increasing the evacuation of blood, but as it was attended with a good deal of trouble, while it did not always prove sufficiently powerful, an exhausting syringe was at last adapted to the glass, which served indeed to extract the air contained in it, but being troublesome in the application, and practitioners finding it difficult to preserve the syringe always air tight, this part of the operation has for a considerable time been chiefly done by applying heat in such a manner to the glasses, as to rarefy the air which they contain in a degree sufficient for producing a considerable suction. And as the instrument in this simple form answers the purpose in view, the use of the syringe will probably be laid altogether aside. The glasses for this purpose, it is evident, must be entire; for if the least communication is allowed between their cavities and the surrounding atmosphere, no effect will result from them.

Different methods are employed for thus applying heat to the cavity of the glass. By supporting the mouth of it for a few seconds above the flame of a taper, the air may be sufficiently rarefied; but if the flame is not kept exactly in the middle, and is allow-

* Celsus, lib. 2. cap. 12.

ed to touch either the sides or bottom of the glass, it is apt to crack and fly in pieces. A more certain, as well as an easier method of applying the heat, is to dip a piece of soft bibulous paper in spirit of wine, and having set it on fire, to place it in the bottom of the glass, and, on the flame being nearly extinguished, instantly to apply the mouth of the instrument upon the scarified part. This degree of heat, which may be regulated by the size of the paper, and which ought to be always in proportion to that of the glass, if long enough applied, proves sufficient for rarefying the air, and at the same time, if done with caution, never injures either the glass or the patient.

If the scarifications have been properly made, they instantly begin to discharge freely on the glass being applied: on being nearly full of blood, it should be taken away, by raising one side of it, or by undoing a screw fitted to a small opening in the bottom, so as to give access to the external air. When more blood is to be taken, the parts should be bathed with warm water; and, being made perfectly dry, another glass exactly of the size of the first, should be instantly applied in the same manner; and thus, if the scarificator has been made to penetrate to a sufficient depth, so as to have cut all the cutaneous vessels of the part, almost any necessary quantity of blood may be obtained. It sometimes happens, however, that a sufficient quantity cannot be got at one place: in this case, we apply the scarificator as near as possible to the parts affected; and this being done, the application of the glasses must also be renewed, as before.

When we wish to discharge the quantity of blood quickly, two or more glasses may be applied at once on contiguous parts previously scarified; and the quantity of blood is more quickly obtained when the cupping glasses are first applied for a few seconds upon the parts to be afterwards scarified. The suction thus produced by the glasses, seems to have some influence

in bringing the more deep seated vessels into nearer contact with the skin, so that more of them are cut by the scarificator.

A sufficient quantity of blood being procured, the wounds made by the lancets should be all cleared of blood ; and a bit of soft lint dipped in a little milk or cream, or spread with wax ointment, applied over the whole, is the only dressing which they require : dry lint is sometimes applied, but it not only creates more uneasiness, but renders the wounds more apt to fester than when previously covered with an emollient.

Although this operation is not difficult, yet a good deal of practice is necessary to perform it in a neat and successful manner ; but with proper attention, any operator may soon do it so expertly as to be able in this way to discharge any necessary quantity of blood.

In some cases of local pains, and in others with a view to promote suppuration, an operation, termed dry cupping, has been proposed, and in some instances practised with advantage : it consists in the application of the cupping glasses without the use of the scarificator. In this manner, a tumor is produced upon the part ; and, where any advantage is to be obtained from a determination of blood to a particular spot, it will not fail to answer.

In Plate V. is represented a scarificator, together with different sizes and figures of cupping glasses, with which every operator should be amply supplied, so as to be able to adapt a glass to every part from whence it may be proper to discharge blood.

When the part from which blood is to be discharged is so situated that a scarificator and cupping glasses can be applied, this method of taking it is preferable to every other ; but it sometimes happens, that parts are so situated as not to admit of their application : thus, in an inflamed state of the eye, of the nose, and other parts of the face, the scarificator cannot be applied directly to any of these parts. In such instances,

leeches are commonly employed, as they may with safety be placed upon any spot from which blood can be taken.

In the application of leeches, the most effectual method of making them fix upon a particular spot, is to confine them with a small wine glass. Allowing them to creep upon a dry cloth, or on a dry board, for a few minutes before being applied, makes them fix more readily; and moistening the parts on which we wish them to fix, either with milk, cream, or blood, tends also to cause them to adhere more speedily than they otherwise would do. As soon as the leeches have come away, the ordinary method of promoting the discharge of blood, is to cover the parts with linen cloths wet with warm water, or even with dry warm cloths: in some situations, this is perhaps the best method we can employ; but wherever the cupping glasses can be applied over the wounds, they answer the purpose more effectually. When the situation and figure of the part will therefore admit of their application, they ought always to be employed.

Among other methods of performing local bloodletting, I mentioned scarifications made with a lancet, or some other sharp instrument: this proves particularly useful in ophthalmia, and often gives immediate relief where general bloodletting has previously been tried in vain. By scarifying the turgid vessels of the eye, so as to discharge perhaps only a few drops of blood, more advantage is often obtained than from the discharge of a great quantity either from the jugular veins or temporal arteries: the mere division of the vessels has in such cases indeed been supposed to prove useful; but I have constantly observed, that the advantage derived from this operation, has been nearly in proportion to the quantity of blood that has been taken.

Different methods have been proposed for performing it. It may be done with the shoulder of a common lancet, but more neatly and more easily by in-

struments that I shall hereafter point out in chapter XI. when speaking more particularly of diseases of the eye.

Among other methods that have been proposed for scarifying the blood vessels of the eye, doing it with the beards of rough barley was at one period much extolled, and by some the practice is still continued. By drawing the beards over the surface of the eye, in a direction contrary to the sharp spiculæ with which they are furnished, a considerable discharge of blood may be produced. But the pain attending it is exquisite; and as it does not possess any superior advantage over the method of dividing the blood vessels with a lancet, it is now deservedly falling into disuse.

I have thus finished the consideration of the various means employed in surgery for discharging blood from the system; and as the disease termed aneurism, is most frequently the effect of an unguarded manner of performing one of the operations that I have just been describing, the farther consideration of the subject cannot, perhaps, be any where more properly introduced than in this place, where one of the principal causes by which it is produced has been so lately treated of.

CHAPTER IX.

OF ANEURISMS.



SECTION I.

General Remarks on Aneurisms.

BY the term aneurism, was originally meant, a tumor formed by the dilatation of an artery ; but modern practitioners make the term apply not only to tumors formed in this manner, but to such as proceed from blood effused from arteries into the contiguous parts ; a circumstance which may take place either from the puncture or rupture of an artery.

A tumor, produced by the dilatation of the coats of an artery, is denominated a true aneurism ; and we term it a false aneurism, where, by the puncture or rupture of an artery, blood is effused into the surrounding parts.

As the introduction of new appellations frequently leads to confusion, necessity alone can justify the attempt in the present work, therefore it will seldom be done ; but as the treatment of aneurism may be rendered more clear and distinct, by a change of terms applied to the different varieties of the disease, it would be culpable in an author not to propose it.

Where aneurism is produced by the dilatation of an artery, as the tumor is circumscribed, and contained within coats peculiar to itself, it may with propriety be termed an encysted aneurism ; while the other, arising from blood spreading among the neighbouring parts, may with equal propriety be termed the diffused aneurism.

As these two varieties of aneurism are, in many circumstances, different from each other, it will be proper to consider them separately.

In the true or encysted aneurism, the tumor, when first observed, is commonly small and circumscribed; the skin retains its natural appearance; when pressed with the fingers, a pulsation corresponding with that of the artery below is distinguished; and by compression, the contents of the swelling, while they are yet soft and fluctuating, may be easily made to disappear.

When means properly calculated for the removal of the disease, are not soon put in practice, the swelling begins to increase, it becomes more prominent, and proceeds in a gradual manner to acquire a larger size. The skin and teguments, for a considerable time, retain their natural appearance; the patient does not complain of pain; the tumor continues of an equal softness; and its contents are still compressible, yielding considerably, and in some instances disappearing entirely, on the application of pressure. At last, however, when it becomes large, the skin loses its ordinary colour, becomes pale, and, in the more advanced stages of the disease, even œdematous: the pulsation still continues; but the tumor, although soft in some parts, yet in others is firm, and cannot be made to yield much to pressure, part of the contained blood having in this stage of the disease become hard by coagulation.

The swelling continuing to increase, at last becomes painful; the skin turns livid, apparently verging to a state of mortification; an oozing of bloody serum issues from the teguments; and if gangrene does not take place, the skin cracks in different parts; and now the force of the artery not meeting with much resistance, if the vessel is large, a period is soon put to the patient's existence, by the blood bursting out with such violence as to produce almost instantaneous death; at least in the larger arteries of the trunk of the body, this is the ordinary event of aneurisms. In the ex-

tremities, however, the arteries are not so large as by their rupture to be capable of producing effects so immediately fatal ; and besides, we can here, by means of the tourniquet, effectually guard against this sudden termination of the disease.

In aneurisms of the larger arteries, the effects produced upon the neighbouring parts, by the constant pulsation and gradual augmentation of the tumor, are often surprising. The softer parts we might, *à priori*, expect to yield to a great extent ; but the hardest parts of the body, probably from their not being capable of yielding, evidently suffer more from the effects of this kind of pressure, than either membranes, muscles, or ligaments. Even the bones frequently undergo a great degree of derangement by the pulsation and distension of contiguous aneurisms : sometimes they are separated entirely from each other at the different joints : in some instances they are elevated out of their natural situations ; and not unfrequently we find them entirely dissolved.

These effects of aneurism, however, are not common in any of the extremities : it is the strong pulsation of the aorta only, or of some of the larger arteries at no great distance from the heart, that can ever produce such important consequences. Sometimes, however, similar effects of an aneurism have been observed in the thigh, and upper part of the arm ; even the bones of these parts have been destroyed by aneurisms of the neighbouring arteries.

These in general are the appearances and termination of the encysted aneurism, to which, however, one exception occurs in a variety of the disease, to be hereafter described.

Various causes may tend to produce encysted aneurisms. 1. From daily observation we know, that partial debility frequently occurs in different parts of the system : thus, there is nothing more frequent than œdematous swellings of the extremities, even in constitutions otherwise healthy ; and these swellings we

justly suppose most frequently to depend on local weakness of the parts in which they occur. Now, why may not debility of a similar kind fall upon part of the arterial system? and, if this should happen, it is easy to see how in almost every instance it must terminate in aneurism: for the force of the heart continuing the same, if any particular part of an artery has lost its tone, as it is thereby rendered unable to resist the pulsations of the heart, dilatation of its coats, must at these weakened parts necessarily ensue; and as soon as a morbid enlargement of the cavity of an artery is thus commenced, as its power of resistance will be proportionally less, while the *vis à tergo* continues the same, the farther increase of the swelling is a consequence that of course must take place.

This may be considered as the most frequent cause of aneurism not depending upon external violence. Aneurisms of the aorta, seem in almost every instance to arise from this cause; as well as all others that do not obviously proceed from external injuries.

2. The external coats of an artery being destroyed by a wound, a partial weakness of the part will thus be produced; and this must render it liable to be acted upon by the heart and other parts of the arterial system, in the same manner as if previously debilitated by disease.

In dilatations of an artery produced by this cause, the progress of the tumor is such as I have described: the blood, from being still confined within the coats of the artery, continues to form a circumscribed tumor. At first the swelling disappears upon pressure; but on advancing farther, part of its contents become so firm by coagulation, as to render it impossible by compression to disperse it. This variety of aneurism may sometimes arise from other causes, but we meet with it most frequently from bloodletting in the arm; by the lancet, after passing through the vein, going so deep as to divide the external coats of the artery without penetrating its cavity.

3. This variety of aneurism has also been produced by the matter of sores and abscesses proving so corrosive as to destroy the external coverings of the contiguous arteries : when this takes place, the same train of symptoms must occur, as if the outer coats of the artery had been destroyed by a sharp instrument.

4. The bones, muscles, and ligaments, give all some degree of support to the arteries which they surround ; so that the destruction of any of these parts must evidently tend to the production of aneurism ; indeed, the firmness and stability of parts naturally connected together, depends so much upon a sound state of the whole, that any one of them becoming weak and diseased, generally terminates in a diseased state of the others. In the thigh of a patient, where part of the muscles and other soft parts were destroyed by an extensive mortification, different aneurismal swellings occurred in the course of the femoral artery which had thus lost part of its support ; and no other cause appeared to be concerned in their production.

5. I have already remarked, that in bloodletting at the usual place in the arm, arteries are sometimes wounded, by the lancet passing through the vein into the artery below ; and when the artery lies in direct contact with the vein, the blood discharged from the orifice in the artery, passing directly into the vein, serves to keep up a communication between them.

A communication being in this manner produced between the artery and vein, and the coats of the vein not being able to resist the impulse of the artery, a preternatural dilatation of the vein must necessarily ensue : a tumor is accordingly soon produced, which at first is small and circumscribed, but at last it gradually extends both above and below the orifice ; not only along the course of the vein originally wounded, but in some instances over all the contiguous veins.

This variety of the disease was first accurately described by our celebrated countryman Dr. William Hunter ; and may with great propriety be termed the

varicose aneurism. Since that period it has been frequently observed by others ; so that its nature is now very generally understood.

Although the coats of the artery are here completely divided, yet, as the blood is contained within the cavity of the veins, this species of the disease is obviously a variety of the encysted aneurism ; and as the method of cure coincides, in some circumstances, with that of other encysted aneurisms, the further consideration of the subject could not any where be more properly introduced.

In the varicose aneurism, the swelling is confined entirely to the veins. Soon after the injury is committed, the vein communicating immediately with the artery begins to swell : in a gradual manner, the tumor becomes more remarkable, and the anastomosing branches of the contiguous veins also become enlarged. This swelling of the veins may, by pressure, be made to disappear, the blood contained in them being in part pushed forward in its course towards the heart, while part of it is sometimes forced into the artery itself ; and, when the tumor is large, the blood, when thus forced out of it, is heard to make a singular hissing kind of noise. This may be always considered as a very characteristic symptom of the disease ; but as it is not met with in every case of varicose aneurism, it becomes necessary to point out such circumstances as more certainly serve as means of distinction.

In the varicose aneurism there is a tremulous kind of motion discovered in the dilated vein, attended with a particular kind of noise, as if air was passing into it through a small aperture.

If a ligature is applied upon the under part of the limb, immediately below the swelling, and tied so tight, as even to stop the pulse in the under part of the limb, the swelling in the veins, on being removed by pressure, returns instantaneously on this being taken off, and does not appear to be affected by the ligature below ; which it undoubtedly would be, were it not for

this direct communication between the trunk of the artery and corresponding vein.

If the swelling is removed, by pressing the blood forward to the heart, and a slight pressure is made with the point of the finger on the orifice in the artery, the veins remain perfectly flaccid ; nor does any swelling take place, till the pressure is removed from the orifice, when it instantly becomes equally large as it was before ; and this even happens, although the pressure on the artery is not so firm as to stop the circulation in the under part of the limb.

In like manner, if the trunk of the artery is compressed above the orifice, so as to stop the circulation entirely, that tremulous motion and hissing noise in the tumor ceases instantly ; and, if the veins are now emptied by pressure, they will certainly remain flaccid till the compression upon the artery is removed. In some instances too, if two ligatures be applied, one an inch or two above, and the other as much below the swelling, and are made so tight, as to stop entirely the circulation of the blood in the tumor lying between them ; if the swelling is now compressed, all the blood contained in it is made to pass into the opening in the artery, from whence, however, it instantly returns again, on the pressure being removed. This does not indeed always happen ; but its not doing so, is no proof of the varicose aneurism not actually existing ; for if all or several of the other leading circumstances of the disease which I have enumerated, ever take place, the nature of the tumor is thereby rendered evident.

In addition to other characteristic symptoms of the varicose aneurism, I may remark, that when the tumor has been of such duration as to excite much dilatation of the veins, the trunk of the artery above the orifice generally becomes preternaturally large, while the branches below become proportionally small ; and of consequence, the pulse in the under part of the

limb is always more feeble than in the sound limb of the opposite side.

Having thus enumerated the ordinary appearances of all the varieties of encysted aneurism, together with the various causes by which they are produced, I shall now proceed to describe the symptoms and causes of the diffused aneurism, and shall conclude with considering the method of cure.

The diffused, or what is commonly termed the false aneurism, consists in a wound or rupture of an artery, producing, by the blood thrown out from it, a diffused swelling in the contiguous parts.

Some of the largest internal arteries are occasionally ruptured by severe bodily exertion ; particularly those of the lungs. This probably happens from the arteries in this organ being surrounded with soft contiguous parts, which do not afford them much support ; for in the external parts of the body, where the arteries are more firmly supported, accidents of this kind are seldom met with. But it is chiefly in that variety of aneurism, produced by wounds of the more superficial arteries, that surgery ever affords relief.

Among other consequences of bloodletting in the veins of the arm, I had occasion to mention wounds in the contiguous artery as one : in a few instances, by the treatment which I then pointed out, the bad effects which otherwise would result from it, do not take place by the wound in the artery being speedily cured. This happy termination, however, of these injuries, is so rare, that it can never with certainty be looked for.

When the puncture of an artery does not heal speedily, it will necessarily terminate in an aneurismal tumor ; and the following is the usual progress which it makes.

A small tumor, about the size of a horse bean, generally rises just at the orifice in the artery, soon after the discharge of blood has been stopt by compression : the tumor is at first soft, and has a strong pulsation.

It yields to pressure, but never in such a degree as that of an encysted aneurism: for, if it be not in the more advanced stages of the latter, the blood remains fluid, and can be easily pressed from one part of the cyst to another; whereas, in the diffused aneurism, the blood forming the tumor is at once extravasated; it soon coagulates, and thereafter becomes firm.

In this state of aneurism, if the swelling is not improperly treated by the application of pressure, it generally remains nearly of the same size for several weeks: it then begins gradually to increase; and if seated at the usual place of bloodletting in the arm, it now proceeds farther up than the orifice, and extends rather more inwardly than towards the outer part of the arm, probably from the expansion of the biceps muscle not being in this place so firm and compact as in the external and under part of the arm. This enlargement of the tumor proceeds, too, more quickly in some than in others, and in some the swelling is much more diffused and extended than in others.

Both these circumstances depend probably upon the same cause. If the blood poured out by an artery, is thrown into a very lax cellular substance, we can easily suppose, that its increase will not only be more rapid, but that the diffusion of the tumor will for the same reason be much more considerable, than when the artery is immediately enveloped with firm membranous or ligamentous parts, which do not so readily yield to the impulse of the blood. From this circumstance alone, indeed, there is such a difference in the progress of aneurism, that in some instances the tumor is many months, nay even years, in arriving at any considerable size; while in others the blood is so quickly poured out from the artery, as to be diffused over the whole limb in the space of a few hours from the operation.

An unusual degree of laxity in the cellular substance has undoubtedly much effect in promoting this rapid

diffusion of the extravasated blood ; but the practice of applying tight pressure in wounds of arteries has, I am convinced, in all such cases, a very hurtful effect. In addition to what I judged it necessary to say upon this point in the chapter on bloodletting, I shall here observe, that if it was possible to make moderate pressure upon the orifice in the artery alone, some advantage might perhaps be derived from it ; but in applying pressure to the artery of a limb, the corresponding vein must be all so much compressed, as to give much obstruction to the return of blood from the artery. And whatever tends to obstruct the reflux blood, must in the same proportion distend the wounded artery, and thereby increase the quantity of blood that escapes by the orifice. Many machines have indeed been contrived for compressing the artery without affecting the rest of the limb : but however much these may have been extolled by their inventors, none have hitherto answered the purpose of compressing the artery alone, without at the same time obstructing the circulation in the veins ; insomuch that much harm has in different instances been produced by all of them.

Whoever may wish to make use of these instruments, will find various forms of them in Heister's System of Surgery, and in the works of Dionis and Platner.

Mr. Dionis, an eminent French practitioner, although he recommends the application of pressure to wounds in arteries, yet relates a case which happened to a surgeon of his acquaintance, in which the bad effects produced by it were so strongly marked, as must convince all who carefully peruse it, of the general impropriety of this remedy.

A surgeon having in bloodletting opened an artery, the usual method of applying tight compression was immediately employed. By this the external discharge of blood was soon stopped : but blood continuing to escape from the orifice in the artery, it passed up towards the superior part of the arm, which it fill-

ed to such a degree, that on the operation for the aneurism, which was soon found necessary, being performed, upwards of four pounds of coagulated blood was discharged from it; and for this purpose it became necessary to lay the parts open along the whole course of the arm.*

When, again, compression has not been applied, unless an unusual degree of laxity prevails in the surrounding parts, the swelling proceeds to increase in a more gradual manner: in becoming larger, it does not, like the true aneurism, become much more prominent; but rather spreads and diffuses itself into the surrounding parts: by degrees it acquires a firm consistence; and the pulsation, which was at first considerable, becomes always less in proportion to this difference of consistence, and to the increase which the tumor receives in size; insomuch, that in large aneurismal swellings of this kind, the pulsation of the artery is scarcely to be perceived.

In the first stages of aneurism, if the blood thrown out from the artery lies deep, the skin preserves its natural appearance, and does not change its colour till the tumor is much advanced. It frequently happens, however, that the blood is thrown out with so much violence at first, as to get into immediate contact with the skin; in which case the parts become instantly livid, as if tending to a state of mortification. A real sphacelus, indeed, has in some instances been induced where the extravasation of blood was considerable, and where the means best suited for its removal have either failed or been omitted.

It must, however, be considered as very culpable neglect, to allow a patient, from this cause, to incur the risk which always results from mortification; for the hazard arising from operating for an aneurism, is inconsiderable, when compared with the danger of an extensive gangrene.

* Vide Dionis's Course of Chirurgical Operations.

On the tumor becoming large, the patient, who at first did not complain of it, is now much distressed not only with severe pain, but with stiffness, want of feeling, and immobility of the whole limb: and these symptoms continuing to augment, if the tumor be not opened, the teguments at last burst; and if the artery is large, and effectual means be not immediately employed for preventing it, death will soon ensue, in consequence of the profuse hemorrhagy which necessarily must succeed.

I enumerated various causes, as being frequently productive, under certain circumstances, of the encysted aneurism: we also meet with some variety in the causes of the diffused aneurism.

I. Violent bodily exertion may be considered, as I have observed above, as the most frequent cause of the rupture of arteries seated internally; but as these do not properly belong to a work of surgery, I shall not here consider them further.

II. The corrosive matter of sores and abscesses, by entirely destroying the coats of contiguous arteries, may in this manner produce the diffused aneurism.

III. The sharp spiculæ of a fractured bone being pushed into a neighbouring artery, have in different instances produced aneurism.

IV. Violent blows have been known to produce this kind of aneurism. This, however, can scarcely happen any where but on the head, where the arteries lie more exposed than in other parts to the effects of this kind of injury, from their being here very thinly covered, and from a blow in this situation falling on the artery lying almost in close contact with a firm hard body, the cranium.

V. If the arterial covering of an encysted aneurism, should ever burst before the external teguments of the tumor, the blood contained in it would diffuse itself into the contiguous parts; in which case, a real diffused aneurism would be formed. There is reason, however, to think that this seldom happens: so far as

I have observed, the internal coverings of aneurisinal swellings never burst first. The tumor proceeds to increase in a gradual manner ; and the teguments at last become so tense and overstretched, that they lose their tone entirely ; the skin becomes soft and œdematous ; in some instances it becomes gangrenous ; and in others, although it retains its natural colour, yet its usual powers are as evidently destroyed as they usually are in the last stage of mortification. In this state, it generally remains for a longer or shorter period according to the strength of the arterial pulsation below. At last, however, the skin begins to crack, and a thin serum oozes out ; the edges of this small fissure in the teguments gradually separate ; and the contents of the tumor having lost a considerable part of their support, the force with which they are impelled, by degrees becomes too powerful for the remaining coverings, which accordingly soon burst, so as to discharge their contents externally, without any effusion into the neighbouring parts.

I should therefore suspect, that authors, in writing on this point, have been mistaken : the encysted, or true aneurism, as it is termed, has been commonly supposed in its last stages to burst internally, and thus to produce the diffused or false aneurism ; from what I have said, however, there is cause to presume, that this is at least a rare occurrence. The progress and termination of the encysted aneurism, in every case that I have seen of it, has been nearly as I have just described it to be ; not by the arterial sac first bursting, but by a rupture of the external teguments after being much overstretched ; the blood being soon thereafter discharged outwardly, and not effused into the surrounding parts. As it has been alleged, however, by very respectable authors, that the reverse of this has sometimes happened, I could not here avoid to consider it as one of the causes of diffused aneurism.

VI. The most frequent cause, however, of the diffused aneurism, are punctures with sharp instruments,

such as swords, cutlasses, and the lancet ; which last may be considered as the most frequent of any.

Under one or other of these heads, almost every circumstance may be comprehended, that can ever tend to produce aneurifimal tumors.

It has unfortunately sometimes happened, that tumors of the aneurifimal kind have been mistaken for abscesses and other collections of matter, and their contents of course have been laid open by incision. The consequences of this may be more readily conceived than described. With a view to prevent such a dreadful occurrence, it would be a point of the highest importance in practice to have such a set of diagnostic symptoms of aneurism set forth, as would with certainty determine the question. In the commencement of the disease, it may, for the most part, be easily ascertained : at this time, the pulsation in the tumor is commonly so strong, and other concomitant circumstances tend so obviously to point out the nature of the disease, that little or no doubt respecting it can ever occur : but, in the more advanced stages of aneurism, when the tumor has become large, and has entirely lost its pulsation, nothing but a minute attention to the previous history of the case can enable us to judge of it with accuracy.

Those swellings, with which aneurisms are most likely to be confounded, are, soft encysted tumors, serofulous swellings, and abscesses containing either purulent or other matter, situated either immediately above, or so nearly in contact with an artery, as to receive the influence of its pulsation : when a tumor of this description is nearly connected with a large artery, the pulsation which it receives from it is frequently so strong and distinct, as to render it impossible, from this circumstance alone, to form any just idea of its contents.

But there is one symptom, which, when connected with a strong pulsation in the tumor, may always lead us to determine with certainty that the swelling is

aneurifmal, and it is this ; the contents of the tumor being made easily to disappear upon pressure, at the same time that they return instantaneously on the pressure being removed. But although the *presence* of this circumstance, when connected with other characteristic symptoms of the disease, may lead us to conclude, that a tumor is of the aneurifmal kind, yet the *want* of it ought not to convince us that it is *not* an aneurifm ; for it frequently happens, particularly in the advanced stages of aneurifm, that the contents of the tumor become so firm and compact, that no effect is produced upon them by pressure. Upon the whole, therefore, as in many instances of aneurifm, no certainty can be obtained of its real nature ; in all such cases, practitioners should lay it down as an established rule, to proceed as if the tumor was in reality of the aneurifmal kind. By adhering to this, they may perhaps in a few instances be deterred from opening tumors, which it may afterwards appear might have been laid open with safety ; but any lesser inconvenience which this may occasion, will be much more than compensated, if, even in a single instance, a surgeon is saved from those disagreeable feelings which he must experience if he should ever have the misfortune to open an aneurifm instead of a collection of matter.

But it is in the trunk of the body only, it must be observed, or in the neck, axilla, upper part of the thigh or groin, that so much caution in the treatment of tumors of this doubtful nature can ever be necessary. For in almost every part of the extremities, and even in all accessible parts of the head, when a tumor of this description has become large, the operation for the aneurifm should always be advised ; for we are in all these parts possessed of a very certain method of preventing danger, namely, the application of the tourniquet in the extremities, and of pressure with the fingers on the head,

In forming a prognosis in cases of aneurism, three important circumstances chiefly require attention. The manner in which it appears to have been produced : the part of the body in which it is situated : and, lastly, the age, and habit of body, of the patient.

If an aneurism has come forward in a gradual manner, without any apparent injury being done to the part, and without having succeeded to any violent bodily exertion, there will then be reason to suppose, that the disease depends upon some local debility of the artery in which it is seated, or perhaps of the whole arterial system : in which last case, little or no benefit can ensue from any attempt that can be made ; as the operation for the aneurism being performed near to the tumor, there would be reason to fear, that the same cause by which it was produced here, ultimately tended to produce similar dilatations in other parts of the artery : whereas, there is much cause to hope, if the tumor has been produced by a bruise, puncture, or other external accident, that the operation would not fail of success, provided the circulation of the part be not altogether destroyed by the ligatures to be put upon the artery.

In the varicose aneurism, we may in general venture on a favourable prognosis. In different instances, it has been found, that the tumor does not increase so rapidly in the varicose aneurism, as in other varieties of the disease ; that as soon as it gets to a certain length, it does not afterwards acquire much additional bulk, and that any inconvenience produced by it may be borne with ease for a great number of years.

It is in this alone, I may observe, that we derive any advantage in the treatment of aneurism from the discovery of this variety of the disease : and a very important discovery it is ; for by means of it a patient may be saved, not only from a very painful operation, but from the risk which must always attend the de-

struction of the principal artery of a limb. When a varicose aneurism becomes so large as to excite much distress, the operation should no doubt be advised; but as long as the inconvenience arising from it can be easily borne, the hazard which very commonly attends the operation, and which nothing but necessity ought to indicate, should certainly be avoided.*

* In Volume II. Art. xxxvi. of the London Medical Observations, two cases are related of the varicose aneurism, by Dr. Hunter. One of them at that time was of fourteen years standing, and the other had subsisted for five years, and no operation had been found necessary. And in Vol. III. of the same work, Art. xiii. a similar case of five years duration is related by Dr. Cleghorn.

As it has been alleged by some that no advantage is derived from the discovery of this species of aneurism, from their supposing that the usual operation is as necessary in it as in any other variety of the disease; and as in different instances the operation has been put in practice even in the incipient stages of the varicose aneurism, where no real necessity, I think, could occur for it; it therefore becomes a matter of such importance as to merit a very attentive inquiry: and it is with much satisfaction that I communicate the following facts, as they tend to establish with certainty, that in the varicose aneurism, the usual operation of obliterating the cavity of the artery, is seldom, if ever, necessary.

In a letter which I received from Dr. Hunter, he says, "The lady in whom I first observed the varicose aneurism, is now living at Bath in good health; and the arm is in no sense worse, although it is now thirty-five years since she received the injury." And the Doctor further observes, that he never heard of the operation being performed for the varicose aneurism, that was known to be such.

In a letter from Dr. William Cleghorn, of Dublin, he says, that the case of varicose aneurism above mentioned, as related in the third volume of the London Medical Observations, remains nearly in the same state as at the time that account of it was made out, which was at least twenty years ago; only that the veins are rather more enlarged. The patient recovered, and the limb became nearly as strong and serviceable as the other. The man has all along continued his business as shoemaker, and has lately recovered from a sprain in the affected arm, which he received in lifting a heavy burden.

In a letter from Mr. Pott, whose opportunities for observation were great, he says, "that he has met with three different instances of this species of aneurism, and that the operation never became necessary in any of them."

Among other instances of varicose aneurism which have appeared here, a young man from Paisley, who had the misfortune to meet with it several years ago, was examined by different surgeons of this place. The disease was clearly marked, and no operation was advised. In a letter from Mr. William Hamilton, Professor of Anatomy in Glasgow, I am informed, that this man was lately serving in the navy, where he undergoes great fatigue without any inconvenience from the aneurism, although it was then of thirteen years continuance.

The site of the tumor is the next point of importance requiring our attention. When an aneurism is so situated that no ligature or effectual compression can be applied for putting a stop to the circulation, if the artery is large, there would be the utmost hazard in laying it open; as the patient might probably lose more blood than his strength could bear, before it could be secured. In aneurisms, therefore, that are so situated, particularly on any part of the trunk of the body, on the neck, axilla, or groin, there can never be a good foundation for a favourable prognosis. In such situations, indeed, the greatest danger is always to be dreaded: for the force of the arterial pulsation would at last be apt to destroy the coats with which the tumor is surrounded; and in such an event, the most fatal consequences might ensue.

The success of this operation must also prove doubtful in the superior parts of the extremities: but in the inferior parts of the arms and legs, it may be performed with a very fair prospect of success, even on the principal arteries; for after the great artery of a limb has crept along the upper part of it, a number of small branches are always sent out, which by anastomosing not only with similar branches below, but by their means with the under part of the large artery itself, these, in the event of the common trunk from whence they sprung being destroyed, come to dilate to such an extent as to carry on the circulation in the inferior part of the limb much more completely than could *à priori* be expected. We would not naturally suppose, after the principal artery of a part has been obliterated, that the circulation would there be afterwards carried on with much force; and yet numberless instances have occurred, of the large brachial artery being completely destroyed by ligature, without being productive of much inconvenience to the parts below; and the same circumstance has also happened, where the operation for the aneurism has

been performed on the trunk of the great femoral artery.*

From what has been said, therefore, it must appear, that when an aneurism is so situated, that compression cannot be applied so as to secure the patient from the loss of much blood when the artery is laid open, the operation should not be advised; and in such cases, the prognosis ought certainly to be very unfavourable. But, whenever an aneurism, produced by external violence, is seated on any of the extremities, where we are sure of commanding the circulation, the operation should always be advised, as soon as there is cause to suspect, that the tumor, if left to itself, might burst, so as to endanger the life of the patient.

The success of this operation, depending in a great degree upon the circulation afterwards going on in the under part of the member, our prognosis ought, *ceteris paribus*, to be more or less favourable, according as the tumor is seated high or low on the limb. For the risk of the circulation being hurt, is always

* In one case, the operation for the aneurism was performed with the most complete success, on the trunk of the femoral artery, about two hand breadths from the groin, by the late Mr. Thomas Hamilton, Professor of Anatomy in Glasgow. And what rendered this case more remarkable, was, that after the trunk of the large artery was secured with ligatures, it was necessary to perform the operation again upon a small branch of an artery which had been wounded, even farther up than the principal trunk.

For some time after the operation, the limb remained colder than the other, and it was upwards of a week before any pulsation could be felt in the artery at the ankle. In two months from the operation, the wound was completely healed, and the circulation and heat returned; and in a short time thereafter, the patient had so far recovered the use of his limb, as to be able to take very violent exercise.

These particulars I thought it right to communicate, as the case of this patient is one of a few well authenticated instances, of this operation having been attempted on the femoral artery so near to its origin; and the success attending it surely points out the propriety of the measure, in every aneurism, even of these parts, not evidently arising from general debility of the coats of the artery.

In Vol. III. Article xii. of the London Medical Observations, another instance is related of the operation for the aneurism having been performed on the trunk of the femoral artery, by Mr. Burchal, surgeon in Manchester: the patient recovered, and the limb became nearly as strong and as serviceable as the other.

in proportion to the height of the tumor : according as it is high or low, this risk is always increased or diminished.

But, lastly, whether an aneurism has been produced by an external injury, or by internal disease, and whatever may be its situation, the habit of body and age of the patient are circumstances meriting particular attention in the prognosis to be formed of the probable event of an operation : in no operation, indeed, are the advantages derived from health and youth more conspicuous than in this ; for in the earlier periods of life, all the softer parts accommodate themselves much more readily to every important change, than they ever do in the more advanced stages of life : in old age, all the animal fibres have acquired so much firmness and solidity, as to be rendered almost incapable of distention : this is particularly the case with the arterial system, some parts of which often proceed to a state of ossification : so that at this period of life, we may readily suppose, that the smaller arteries are rendered incapable of that degree of distention necessary for supplying the want of the principal artery of a part, which in the more early periods of life, they might with ease have done.

This operation having been performed with various success, even where the tumors were apparently similar, both in situation and other circumstances, various reasons have been suggested to account for it. With some the operation has succeeded, even under circumstances apparently more unfavourable, than with others where it failed. Thus it has proved successful, as I have lately remarked, in the trunk of the femoral artery, while in others, it has failed when done in the ham : that is, in the former the circulation in the under part of the leg was still preserved, and the patients recovered ; while, in the latter, where success might more readily have been looked for, the limbs remained cold after the operation, no return of circu-

lation took place, mortification at last was induced, and the patients died.

From this variety of success attending it, we find very contradictory opinions held forth respecting this operation. While one condemns it, as seldom proving successful, if it be not in the very extreme parts of a member; others assert, that it may be done even in the largest artery of a limb, and with great probability of success.

This contrariety of opinion, however, may, I think, be explained, by what I have said concerning the age and habit of body of those on whom the operation is performed; for, to the different powers of distention with which the arterial system is endowed at different periods of life, the good or bad success with which it is attended, may, with sufficient reason, be often assigned. So that, although it may fail in an old infirm person, even in the under part of the leg or arm, we ought not to be thereby deterred from advising it, even in much higher situations, where the patient is young and healthy.

It may also be proper to observe, that in the ham the operation is seldom done so well as in the thigh: the artery lies so deep in the ham, that it is taken up with more difficulty; by which a considerable quantity of blood is often lost; the strength of the patient is in this manner exhausted; and hence he often sickens and dies, when otherwise he might probably have recovered.

Having thus considered the usual appearances and causes of aneurism, together with the grounds upon which a just prognosis is to be formed, we shall now proceed to the method of cure.

SECTION II.

Of the Treatment of Aneurisms.

PRESSURE has been indiscriminately advised in aneurism, not only in the beginning of the disease, but in its more advanced stages. In a former chapter, on bloodletting, as well as in some parts of this, this subject has already been noticed: to these I must now refer; and shall at present advert to such points only as were not before considered.

In the diffused or false aneurism, pressure has been advised, not only with a view to discuss the tumor; but in order to produce a reunion of the wound in the artery: I have already made it appear, however, as pressure in such cases cannot be applied to the artery alone, without at the same time affecting the veins; and as this, by increasing the resistance to the arterial pulsations, must force an additional quantity of blood to the orifice in the artery, that in this way it must often do harm.

But although pressure should never be advised in any stage of the diffused aneurism, yet in some periods of the encysted aneurism, it may often be applied with advantage.

In the early stages of encysted aneurism, while the blood can be yet pressed entirely out of the sac into the artery, a bandage of soft and somewhat elastic materials, properly fitted to the part, will often prevent an increase of the tumor; and, in some few instances, by the continued support thus given to the weakened artery, complete cures have been obtained. In all such cases, therefore, particularly in the varicose aneurism, which I have already endeavoured to shew can seldom require the usual operation, much advantage may be derived from moderate pressure.

But although pressure to a certain degree has frequently proved useful in encysted aneurism, it ought never to be carried far; for tight bandages, by exciting reaction in the parts to which they are applied, instead of answering the purpose for which they were intended, have often the contrary effect. Moderate pressure, therefore, is more eligible than a great degree of it; nor ought it ever to be employed but as an easy support to the weakened parts.

While we thus, however, advise compression, other means ought not to be omitted: the patient should be kept upon low diet; if the pulse is full, blood should be taken; the bowels should be kept open; and all violent exercise, particularly of the injured part, should be carefully guarded against. In the latter stages of aneurism, when much tension and pain are induced, opiates prove useful; and often indeed are the only remedies from which we obtain relief.

This course of treatment applies to every aneurism for which the operation is not to be performed; whether this may proceed from the seat of the disease rendering it inadmissible, or from any other cause: in such circumstances, indeed, an easy support by means of gentle compression; a low diet in order to prevent a plethoric state of the vessels; repeated bloodlettings when plethora actually exists; a total abstinence from exercise; and the use of opiates when indicated by pain; are the only remedies from which much benefit is ever likely to be derived.

Having thus pointed out the different remedies to be employed where the operation is not to be performed, I shall now proceed to describe the operation itself, a measure that becomes necessary when the means recommended for the previous treatment of the disease have failed, or when the tumor has made much progress before proper assistance is procured.

Our first step in this operation is, to obtain a full command of the circulation in the under part of the limb, by means of the tourniquet applied above.

This being done, the patient should be so placed, that the diseased limb, on being stretched on a table; may be of a proper height for the surgeon, who ought to be seated during the whole course of the operation. The limb being in this situation properly secured by assistants, an incision is now to be made with a scalpel through the skin and cellular substance, along the whole course of the tumor; and in order to ensure sufficient freedom for the remaining steps of the operation, this external incision should be carried at least half an inch past each end of the tumor. No mischief can ensue from the first incision being free and extensive; and I have seen different instances of the surgeon, being much embarrassed in the subsequent steps of the operation, by timidity or ill judged lenity in this part of it.

This being done, the surgeon usually proceeds in a slow cautious manner, dissecting away one layer of the membrane after another, till the artery itself is laid bare. In this manner the operation is always tedious, for the thickness of parts with which the artery is covered, is often very considerable, by one layer of a membranous substance having formed after another, from the coagulable lymph of the blood contained in the tumor: but there is no real cause for this degree of caution, as the operation may be equally well performed, in a shorter space of time, and with much less pain to the patient.

As soon, therefore, as the external incision of the skin and cellular substance is completed, a lancet should be pushed into the sac, so as to make an opening sufficiently large for admitting one of the fingers: this being done, the forefinger of the left hand should be introduced at the opening, when the sac should be cut from one end to the other, by running a probe pointed bistoury along the finger from below upwards, and afterwards from above downwards, so as to lay the whole cavity open.

The cavity of the tumor being thus laid open, all the coagulated blood is now to be taken out : for which purpose, a variety of scoops and other instruments have been invented, but no instrument answers this intention so well, and with so much ease to the patient, as the fingers of the operator.

The coagulated blood being removed, together with the membranous filaments usually found in aneurismal tumors, the cavity of the sac must now be dried with a small sponge, when the tourniquet should be made perfectly slack, in order to discover not only the artery itself, but the opening into it from whence the blood collected in the tumor has all along issued. This being done, we are next to employ proper means for preventing any farther effusion of blood into the sac. Various means have been proposed for this ; but they are all comprehended in those that follow :

I. Ligatures upon large arteries, having in some instances destroyed the circulation in the under part of a limb, it was long ago proposed, on laying open the sac, to endeavour to finish the cure, by applying a piece of agaric or dry sponge to the orifice in the artery ; and in some instances, vitriol and other astringents, were used for the same purpose.

II. Upon the same principle with this, namely, that of still preserving the circulation in the whole course of the artery, it was some time ago proposed by Mr. Lambert, an eminent surgeon of Newcastle, to secure the orifice in the artery with the twisted suture.* A small needle being pushed through the edges of the wound, they are then to be drawn together by a thread properly twisted round the needle, in the manner I have advised when treating of futures.†

These methods, however, are both liable to objections : in the first place, neither sponge, agaric, nor

* Vide London Medical Observations, Vol. II. Article xxx.

† Vide Chap. VI. Sect. V.

any astringent with which we are acquainted, is possessed of such powers as to deserve much confidence; for, although in a few instances, they have put a temporary stop to hemorrhagies, they have seldom produced any permanent benefit. In almost every instance in which they have been used, the hemorrhagy has recurred from time to time, so as to prove highly distressful, not only to the patient, but to the practitioner; so that from this want of success, little or no attention is now given to remedies of this class.

With regard to Mr. Lambert's method of stitching the orifice in the artery, it is certainly an ingenious proposal, and would probably, in most instances, put an effectual stop to all farther discharge of blood; but as it has hitherto been very seldom practised, farther experience of its effects must be obtained, before we can with propriety either receive or reject it. But if, in a matter of such moment, reasoning may be admitted, I would beg leave to observe, that two material objections occur to it. One is, that in almost every instance of aneurism, the artery lies at the back part of the tumor; so that when all the collected blood is removed, there is such a depth of wound, that it must be always difficult, and in many instances impossible, to perform this nice operation upon the artery, with that attention and accuracy, which, in order to insure success, it certainly requires. It has sometimes, indeed, happened, that the artery has been found on the anterior part of the tumor, in which case the orifice would no doubt prove sufficiently accessible. This, however, is a rare occurrence, as in almost every instance of diffused aneurism the artery lies at the bottom of the tumor, the blood being collected between it and the common teguments; and accordingly I have seen several instances, in which, after the tumor was laid freely open, the artery was found to lie so deep as to render it impossible to perform this operation.

But there is another very important objection to this practice recommended by Mr. Lambert. By introducing a needle through the sides of the orifice, and drawing these together with a ligature, the cavity of the artery must undoubtedly be at that point much lessened. Mr. Lambert, indeed, in his account of the only case in which he performed this operation, acknowledges that the diameter of the artery was thereby diminished. Now, the passage of the blood being thus contracted at one point, the impulse upon that particular part must be very considerable: so that the very remedy employed for the cure of one variety of aneurism, must in all probability prove a powerful agent in inducing another; for the blood being thus obstructed in its usual course, there will be much hazard of a dilatation being produced immediately above the stricture from which an encysted aneurism is very likely to ensue.

I must fairly acknowledge, however, that all I have advanced, proceeds from reasoning alone, for, as yet, I cannot speak of it from experience. But, if farther trials of this operation shall tend to show that the objections which I have stated against it are not well founded, no one will be more ready than I shall be to adopt it; for, if these objections were removed, I should consider this operation as deserving to be ranked among the most important improvements which in modern times surgery has acquired. In the treatment of aneurism by the common operation, if the principal artery of a limb is concerned, some risk is always incurred, not only of injuring the parts below in a most material manner, but even of destroying them entirely, by depriving them of the quantity of blood necessary for their support. Now, by Mr. Lambert's improvement, an effectual stop is put to the farther evacuation of blood, while at the same time the circulation in the diseased artery is preserved; so that if farther experience of its effects shall evince, that the objections which I have stated against it are not well

founded, it will deservedly be admitted as an important improvement in the cure of aneurism.*

III. Neither of these methods being to be trusted, I shall now proceed to describe the usual method of performing this operation, and it consists in obliterating the arterial cavity entirely with ligatures.

The artery being laid bare in the manner I have directed, and the coagulated blood carefully removed from the cavity of the tumor, on the tourniquet being made slack so as to bring the orifice in the artery into view, a probe should be passed into it, with a view to raise the artery from the contiguous parts, so that the surgeon may be enabled with certainty to pass a ligature round it without comprehending the contiguous nerves, which in general run near to the large blood vessels of the limb. By this precaution, the nerves may be always avoided; by which much mischief may be prevented, which otherwise would probably supervene. In aneurisms seated in the ham, or in the usual place of bloodletting in the arm, bending the joint of the knee or elbow, by relaxing the artery, renders this part of the operation more easy, than when the limb is kept fully stretched out.

The artery being thus separated from the contiguous parts, a firm waxed ligature must be passed round it, about the eighth part of an inch above the orifice, and another at the same distance below. More than this is commonly advised, but much harm has arisen from the ligatures being passed so far from the orifice as is commonly done; for the risk of losing the benefit of anastomosing branches must always be in proportion to the extent of artery included between the ligatures.

* Since the first editions of this work were printed, this operation has been once performed in the Infirmary here; but although done with sufficient accuracy and attention, it did not succeed; and before a cure could be obtained, it was judged necessary to perform the operation in the usual way.

The easiest method of introducing the ligatures, is by means of a blunt curved needle, of the form represented in Plate V. fig. 2. A common sharp needle is usually employed; but it does not answer the intention so well. Being sharp in the point and sides, it is apt to injure the contiguous parts; and when the common crooked needle is used with a sharp edge on its concave side, there must even be some risk of wounding the under part of the artery, as the needle in this situation can scarcely be introduced without being in contact with the coats of it. The blunt needle is not liable to either of these objections; and besides, when of the form represented in the plate, it is more easily introduced than any of the needles commonly used in this operation. Of late a new instrument has been proposed instead of it: a curved silver tube being passed beneath the artery, a probe, fitted to the tube, and previously armed with a ligature, is then pushed through it, and the ligature drawn along with it: it proves to be, however, a much more complex method of answering the same purpose with the needle, and will never therefore be employed by those who have used the other,

The ligatures being both passed, the upper one is now to be tied sufficiently firm for compressing the sides of the artery. By some, a small bolster of linen is inserted between the artery and the knot, in order to prevent the artery from being cut. This, however, can answer no good purpose; for if the whole artery is not surrounded with the bolster, it will be just as liable to be cut by the ligature, as if this precaution had been omitted: and besides, as I have elsewhere had occasion to remark, the ligature on arteries need never be so tight, as to incur the risk of dividing them; much less pressure than is commonly applied being sufficient.

The upper ligature being thus finished, before the knot is passed upon the other below the orifice, the tourniquet should be untwisted, in order to see wheth-

er any blood is discharged by the wound in the artery or not. If blood flows freely, it will afford a pleasant prospect of the success of the operation, as it will shew, that the anastomosing branches are sufficient for carrying on the circulation in the under part of the limb. But although blood should not be discharged at this time by the orifice, we are not, from this circumstance alone, to despair of success; for it frequently happens, that the operation succeeds, although no blood is discharged on the trial that I have advised.

But whether any blood should be discharged by this trial or not, we should not rest satisfied with one ligature; for unless the ligature below the orifice is also tied, hemorrhagies may probably take place on the return of circulation to the under part of the artery: this precaution, therefore, should never be omitted; it is easily done, and it renders the patient secure against all farther loss of blood. After the knots are tied, the ligatures should be cut of such a length as to admit of their ends lying over the wound, so that when necessary they may be more easily withdrawn.

With a view to farther security, it has been advised to insert other two ligatures quite contiguous to these, and to leave them untied, so that if either of the others should happen to fail, its place may be immediately supplied.

There is not, however, any cause for this precaution, for, if the first ligatures are properly applied, they will not fail to answer the purpose; and in the event of one or both of them giving way, they can be easily renewed: we also have it in our power to render the patient safe against any sudden discharge of blood, by leaving the tourniquet loose upon the upper part of the limb, which it ought always to be for several days after the operation, so that, in the event of blood bursting from the wound, it may at once be secured.

The ligatures being completed, the tourniquet should be made loose; and if no blood is discharged at the

orifice in the artery, we may conclude that the operation is properly performed.

The wound should now be lightly covered with a pledget of any emollient ointment; and a compress of soft lint being applied over the dressings, the whole should be secured with two or three turns of a roller above, and as many below the centre of the wound.

The patient being now laid in bed, the limb should be placed in a relaxed posture upon a pillow, so as to create the least possible uneasiness from the posture in which it is placed.

As this operation is always tedious, and excites much pain and irritation, a full dose of laudanum should be given immediately after it is finished. With a view to diminish sensibility in chirurgical operations, I have in different instances given opiates about an hour before: with some, this has evidently proved useful, but with others it has appeared to do harm; particularly in weak irritable constitutions, in which with any doses I ever ventured to give, the patients appeared to be rendered more susceptible of pain, than if no opiate had been taken. Immediately after every operation of importance, however, an opiate should be given, and repeated occasionally, according to the degrees of pain and restlessness which take place.

In some few cases of aneurism, it happens, that the pulse in the under part of the limb is perceptible immediately after the operation. This, however, is not frequent; for aneurism being more commonly met with at the joint of the elbow, as a consequence of bloodletting, than in any other situation, and as it rarely happens that the brachial artery divides till it passes an inch or more below the joint, the trunk of this artery is therefore most frequently wounded; and, as the ligatures in this operation must obstruct the passage of almost the whole blood going to the under part of the arm, there can be no reason to expect any pulsation at the wrist, till the anastomosing branches of the artery have gradually become so much enlarg-

ed, as to transmit such a quantity of blood to the under part of the limb, as may be sufficient for acting as a stimulus to the larger branches of the artery.

Immediately after the operation, the patient complains of numbness or want of feeling in the whole member; and as it commonly becomes cold, it ought to be kept properly covered. In ten or twelve hours from the operation, although the numbness may continue, the heat of the parts generally begins to return; and, in the course of a few hours more, all the under part of the limb is even apt to become preternaturally warm.

Although physiological discussions are not immediately connected with our subject, and although I shall not therefore enter on them often, yet I cannot here avoid to remark the clear proof which we derive from this operation, of the great dependence that one part of the human frame has upon another. The nerves we know to be the instruments of sense and motion; but on being deprived of their usual support from the sanguiferous system, their influence is instantly lessened.

Immediately after this operation, the want of feeling in the parts below the ligatures, is commonly great; and in proportion as the circulation takes place in the under part of the limb, the feeling never fails to return. If we could suppose the nerves of the parts below to be always included in the ligature with the artery, that numbness which succeeds to the operation might be easily explained; but I have known it happen when nothing but the artery was secured with the ligature: and besides, although the knot upon the nerves would account for the immediate loss of sensibility which succeeds to the operation, it would not serve to explain the return of feeling, on the circulation being restored; for the nerve being destroyed by the ligature, if the want of feeling originated entirely from this, in what manner could the return of blood to the part be supposed to act in restoring it?

In the mean time, the regimen and situation of the patient are points which require particular attention: he should be allowed cordials and nourishing diet when low and reduced, and confined to a low diet, if his constitution is plethoric: the limb should be kept in a relaxed posture, and towards the end of the fourth or fifth day, if the operation is to succeed, a weak feeble pulse is discovered in the under part of the limb; and as this becomes stronger, the patient in the same proportion recovers the use and feeling of the parts.

As soon as matter has formed about the sore, which seldom happens till the fifth or sixth day, an emollient poultice should be applied over it, in order to soften the dressings, which should then be removed. At this time, too, the ligatures might be taken away; but as their continuance for a few days longer can do no harm, it is better to allow them to remain till the second or third dressing, when they either drop off of themselves, or may be taken away with more safety. The dressings, which should always be of the softest materials, being renewed every second or third day, according to the quantity of matter, the sore for the most part heals easily; and although the patient may for a considerable time complain of numbness, and want of strength in the diseased limb, yet in most instances a very free use of it is obtained at last.

It will be readily supposed, that this termination is the most favourable that can possibly happen. In some instances, our success is far from being so complete: instead of a return of circulation, and of the feeling and use of the parts, they remain cold and insensible, and no marks of returning life are perceived. From a mere want of blood, therefore, mortification at last takes place; and as nature is here deprived of one of her principal agents for the removal or separation of gangrenous parts, I mean the efforts of the sanguiferous system, the disease for the most part terminates fatally,

Whenever mortification, therefore, ensues as a consequence of this operation, if the patient survives till a separation takes place between the healthy and diseased parts, amputation of the limb is then our only resource.

That this operation, when performed upon the principal artery of a limb, sometimes terminates in this manner, no practitioner will deny; but its doing so in some instances, does not warrant our rejecting it in all. The event of every capital operation is very uncertain; and in this, as in every other of equal importance, as we cannot in any case say with precision how it will succeed, so we are never to advise it where means of a less hazardous nature will answer: while, on the contrary, when these are found to fail, and the patient's life appears to be in danger, it ought without hesitation to be performed.

Among the numerous improvements which modern surgery has experienced, one of the most ingenious is a new method of operating for the cure of the popliteal aneurism, first proposed by the late Mr. John Hunter, of London.

In operating for this variety of aneurism in the usual way, the depth of the artery renders it both difficult and tedious; besides which, from the artery being frequently diseased for a considerable way above the seat of the aneurism, the operation is thereby apt to fail. With the view of avoiding these difficulties, the femoral artery is secured, in the new operation, about the middle of the thigh; by which, when the operation succeeds, the tumor in the ham soon disappears, and in the course of a few weeks, the patient recovers the use of his limb.

In performing the operation in this manner, the tourniquet should be applied as near as possible to the top of the thigh; but not drawn tight, in order to preserve the parts in their relative situations; an incision, four inches in length, is then made through the

skin and cellular membrane, rather above the middle of the thigh, and crossing the inner edge of the sartorius muscle in an oblique direction from above downwards. The sartorius being brought fully in view, the edge of it must be raised where the pulsation of the artery is perceived through the fascia by which it is covered. This is next to be divided to the extent of two inches, when the artery must be carefully separated from the nerve and vein with which it is accompanied; and a broad waxed ligature of silk being passed round it, by means of a blunt edged hook, a firm knot must now be tied on it; and the ligature being left out at the edges of the wound, they should then be laid together, and the whole covered with a pledget of simple ointment.

On the patient being put to bed, a tourniquet should be applied loosely on the upper part of the thigh, with the view of putting a stop to any unexpected hemorrhagy, and the limb should be placed on pillows, raised to such a height, that the thigh and leg may form an angle with the body, as well as with each other; in this manner, relaxing the muscles, and particularly the sartorius, as much as possible; care being also taken, during the first eight or ten days, to retain the limb steadily in this situation.

On the fourth or fifth day, the dressings may be changed; but the ligature should not be drawn till the fifteenth or sixteenth day, when in general it will come easily away. Till the end of the third week, the patient should be kept in bed; nor should he be allowed to use his limb with freedom for the space of several months after the operation.

This is undoubtedly a very important improvement on the method of operating for the popliteal aneurism, but further experience of the effects of it alone can shew whether it will in general succeed or not; and till this shall be obtained, we must remain uncertain, whether this operation, or that of amputating the limb

at the upper part of the thigh, will fall to be preferred ; for it is not that mode of conducting a cure which carries the best appearance, that ought to meet with our preference, but that which experience proves to be the best, in consequence of its saving the greatest number of lives.

CHAPTER X.

Of Affections of the Brain from External Violence.

SECTION I.

General Remarks on Affections of the Brain from External Violence.

AFFECTIONS of the brain from external violence, often induce a very complicated set of symptoms; are attended with imminent danger, and give much embarrassment to practitioners: accordingly, both with respect to the hazard with which they are attended, and the difficulty that we meet with in the cure, there is perhaps no class of diseases to be compared with them. Wounds and bruises of the head, which at first exhibit no marks of danger, often induce a train of symptoms which elude the skill of the most experienced practitioner; and, without admitting of any mitigation, proceed to a fatal period, ending only with the death of the patient.

The very intricate nature of these affections has excited the attention of practitioners from the time of Hippocrates downwards; but although this branch of practice has received some important improvements, from the industry and observation of modern surgeons, yet it must be admitted, that much still remains to be done in it. Authors of the last and preceding centuries have proposed modes of treatment in affections of the head, which modern practitioners do not admit; whilst in various points of importance, surgeons of our own times differ materially from one another.

This uncertainty which prevails with respect to the nature and treatment of these affections, proceeds from different causes, the principal of which appear to be the following.

I. The necessity of a sound and entire state of the brain for the purposes of life and health, together with the peculiar delicacy of its structure, makes injuries which in other parts of the body would induce no danger, when inflicted on this organ productive of the most alarming consequences.

II. The brain being surrounded with a firm covering of bone, it is always difficult, and in many cases impossible, to obtain an exact knowledge of the nature of the case, and of the parts more immediately injured : inasmuch, that while the attending symptoms often lead us to presume that the brain has suffered, if no external marks of injury appear, we are frequently at a loss to determine where the instruments necessary for the relief of the patient should be applied : for this reason, we have not, perhaps in any instance, so much cause to regret our very limited acquaintance with diseases, as in affections of the brain ; in which, discoveries are often made upon dissection after death, a knowledge of which, if obtained a day or two sooner, might have put it in our power to save our patients.

III. The most material impediment to our successful treatment of diseases of this class, is the impossibility of obtaining an easy and free access to the injured parts, even when we know with certainty where they are seated. For, the brain being on all sides surrounded with bone, we can rarely accomplish so extensive an exposure of the injured parts as the proper treatment of them requires.

IV. The manner in which diseases of the head from external violence have been commonly described, has had some influence in rendering this part of practice perplexed and intricate. Till of late years, authors have attended more to the consideration of the causes

which induce diseases of the head, than to the real nature and treatment of the affections themselves : occupied almost entirely in describing the one, they have very universally passed over the other too remissly.*

Thus, the various contusions and wounds to which the head is exposed, have been particularly described ; and every variety of fracture which can happen has been mentioned with a minute accuracy. The most trifling differences that can occur, have been distinguished by particular appellations, and much ingenuity has been exercised in describing the extent with respect to length and breadth, and every other circumstance relative to the figure of a fracture ; points of very little importance ; and which, when so much insisted upon, tend to perplex not only the younger, but even the more experienced part of the profession. Nothing, indeed, can set the impropriety of such distinctions in a stronger point of view, than our observing daily that no advantage ever ensues from them. It is the effect which fractures of the skull and other injuries produce upon the brain, which we ought to consider, and not their external appearances.

If indeed the effects produced upon the brain by a fracture of the skull could be determined by the size and figure of the fracture, it ought to be minutely described ; but every practitioner knows that this is not the case. Fractures of the smallest size will in some instances produce the most dangerous symptoms, whilst in others those of the greatest extent excite no alarming appearance. As long as it was imagined that the danger induced by fractures of the skull was in proportion to their extent and figure, we need not be surprised at the attention with which these circumstan-

* The French authors upon this subject, were the first among the moderns who wrote upon it with precision. And among these, that judicious practitioner, Monsieur Le Dran, stands particularly eminent : I need scarcely observe too, that the public are much indebted to our countryman, the late Mr. Pott, for his valuable work upon this subject.

ces were considered ; but now, while we know that no advantage can be derived from distinctions of this kind, I shall not judge it necessary to dwell particularly upon them.

These are the circumstances which render the management of affections of the brain from external violence uncertain. In the subsequent part of this chapter I shall endeavour to point out the means best calculated to extricate this part of practice from such uncertainty ; but before proceeding to do so, it will not be considered as improper our giving a concise anatomical description of the parts most apt to suffer from injuries done to the head ; as by this the subject will be rendered more clear and intelligible.

SECTION II.

Anatomical Description of the Brain and surrounding Parts.

THE brain and cerebellum, with their membranes the dura and pia mater, have for their protection a covering of bone, the cranium.

The cranium consists of eight bones, forming an oblong vault or box, flattened on the sides by the superior firmness of the lower part of the temporal bones, and by the constant action of the temporal muscles : it is more capacious on the back part than before, the lobes of the brain being here more extensive.

The bones of the cranium or skull, are, the frontal bone, the two parietal bones, the two temporal, the occipital, the sphenoid, and ethmoid. The first six of these are said to be proper to the skull, the two last being considered as common to it and the face. The os frontis forms all the anterior or forepart of the cranium, the ossa parietalia the middle and upper part, and the os occipitis the posterior part of it : the ossa

temporum form the lower part of the sides of the cranium; and the sphenoid and ethmoid bones form the centre, or what is commonly termed the basis of the skull; but as these two last mentioned bones lie so deep, as to be entirely out of the reach of any surgical operation, any injury to which they may be exposed, must in almost every instance prove fatal.

The other six bones are connected together by joints or indentations, termed sutures, which are five in number, the coronal, sagittal, lambdoid, and two squamous. The coronal suture extends over the head, from within a short space of the external canthus of one eye, to within an equal distance of the other on the opposite side of the head; and in its course, it serves to unite the frontal bone to the anterior edge of the two parietal bones. The sagittal suture unites the parietal bones on the superior part of the skull, by running almost in a direct line from the middle of the frontal bone to the middle of the os occipitis: in some instances this suture proceeds along the whole extent of the os frontis, and terminates immediately above the nose, by which that bone is divided into two equal parts; and instances are mentioned of the occipital bone being divided in a similar manner; but this is confessedly a rare occurrence.

The lambdoid suture, so called from its resemblance to the Greek letter Λ , begins where the sagittal suture terminates, at the middle of the superior edge of the occipital bone; and its two crura or legs stretching down to the basis of the skull, serve to unite this bone to the posterior edge of the two parietal and temporal bones. It is in the course of this suture, namely, the lambdoid, that these small irregular ossifications, termed ossa triquetra, are most commonly met with. In some instances they penetrate the whole thickness of the bone; but in others, they are chiefly confined to the external lamella of the skull, being scarcely perceptible inwardly.

The last futures we have to notice, are the two squamous, which serve to unite the superior part of the temporal bones to the under and corresponding parts of the ossa parietalia.

In young people, these five futures are almost universally met with, and it is necessary that practitioners should be well acquainted with their direction; but it is proper to observe, that in older subjects, some of them are often wanting. Instances are even recorded, in which all the futures were completely obliterated; but this I believe to be a very rare occurrence. The sagittal and coronal futures, are those that are most frequently wanting.

Various advantages are derived from the formation of the skull by separate bones; but that which we have particularly to mention, is, that at the futures, a more direct communication, by means of blood vessels, takes place between the membranes of the brain and the teguments of the skull, than otherwise could have been the case; and by means of these futures, too, there is reason to suppose, that fractures will not spread so extensively as if the whole cranium was formed of one bone only.

Some advantage is in this manner accordingly derived from the skull being formed of different bones; for in the early stages of life, while the bones are not firmly connected together, fractures do not so readily pass across the futures, as they afterwards do: but nature must surely have had some other intention in this mechanism, otherwise the more perfect adult would not probably be deprived of an advantage which the earliest period of childhood enjoys in greater perfection: and although I have said, that the futures have evidently some influence in young people, of stopping the progress of fractures, their effect is evidently not considerable; for daily observation evinces, that fractures pass from one bone of the skull to another, even while the futures remain in every respect entire; a circumstance which every young prac-

itioner especially should be aware of ; for, from many observations to be met with in some of our older writers, we might be led to imagine, that fractures rarely if ever traverse the futures, which, however, we frequently find them do.

The bones of the skull are, for the most part, composed of two lamellæ or tables, separated by a kind of bony network, or cancelli, commonly termed the diploë. The external table is every where considerably thicker than the internal, which is firm, compact, and more brittle than the other ; which readily accounts for what we sometimes meet with, a fracture and even a depression of the internal table of the skull, while the external surface of the bone remains entire : but it unfortunately happens, that the discovery of this is seldom or never made, till it is too late to prove useful ; I mean not till after the death of the patient.

In the directions given by authors for applying the trepan, we are commonly desired to proceed with much caution in passing the instrument through the inner table of the skull, while we are told that no danger can ensue from proceeding quickly in the first part of the operation till the outer table and diploë are fairly penetrated. This however proceeds upon the supposition of the two tables of the skull, with the intermediate diploë, being at all times distinct and obviously marked. Now we know, that this is not the case ; for the diploë becomes less with age, and in many instances it has been so completely obliterated as to take away entirely the appearance of two tables of the skull over all the upper part of the head : and besides, in some parts of the skull, the diploë is naturally wanting, particularly in different parts of the os occipitis, owing perhaps to the pressure produced upon this bone by the muscles with which it is covered. It is also wanting at the under part of the os frontis, where the two lamellæ of this bone separate immediately above the eyebrows, in order to form the two

cavities of the frontal sinuses ; whilst in general it is more distinctly observed over all the superior part of the frontal bone, and through the whole extent of the ossa parietalia, than in any other part of the skull.

The external surface of all the bones of the upper part of the cranium, is in general smooth and equal, and this is also the case with the internal surface of the same parts of these bones, excepting the temporal bones and some part of the ossa parietalia, in which several deep furrows are formed by the pulsation of the arteries of the dura mater. But although the upper part of the skull is commonly smooth, almost the whole under part of it is rugged and unequal. This inequality on the outside seems to be calculated for the better attachment of the different muscles which move the head ; and on the inside it serves the purpose of supporting the different parts of the brain and cerebellum.

Almost the whole of the occipital bone is very unequal both in its external and internal surfaces : this is likewise the case with all the inferior part of the temporal bones, and with the under part of the os frontis ; so that none of these situations are so proper for the application of the trepan, as the more smooth and equal parts of the skull.

The skull is externally covered with the common teguments of the body, the skin, and cellular substance ; with the frontal, occipital, and temporal muscles, and an aponeurotic expansion formed by a combination of the tendinous fibres of them all ; and more immediately by the pericranium, a very strong membrane, which adheres firmly to every part of it, but particularly at the sutures.

It has by many been supposed, that the cavity formed by the bones of the skull, is not naturally completely filled. This, however, is now known to be an opinion void of foundation ; for every part of this cavity is occupied by the brain and cerebellum, with their investing membranes the dura and pia mater.

The dura mater which is a strong inelastic membrane, adheres every where to the internal surface of the skull by an infinite number of small vascular filaments, as is evident by those innumerable points of blood which appear over the surface of this membrane, and through the whole internal surface of the skull, on the cranium and dura mater being forcibly separated from each other. This adhesion, however, of the dura mater to the cranium, is much more firm at the futures than in any other part, owing to the blood vessels which pass out here being not only more numerous, but of greater magnitude than in the rest of the skull. In other parts of the head, any vessels which pass from the dura mater to the skull seem to be chiefly intended to supply the internal table, and the diploë, with blood; but at the futures an evident communication takes place, by means of blood vessels, between the external coverings of the skull and the membranes of the brain, a circumstance which practitioners should be aware of, as it not only serves to explain many of the phenomena attending injuries done to the head, but likewise points out the most probable means of guarding against them. By our knowledge of this part of the anatomy of the head, we learn, that the futures are not the most eligible parts for the application of the trepan; and, on the contrary, that this operation should never be performed in the course of a future, if the same intention can be answered by applying the instrument on any other part; and that, by the firm adhesion of the dura mater to the skull at the futures, matter or blood collected on the surface of that membrane on one side of a future, will not be discharged by a perforation made on the opposite side of it.

The dura mater, the firmness of which renders it particularly proper to support the brain by its different productions, is of too hard a texture to be immediately connected with that very delicate organ. It is therefore every where lined with another soft mem-

branous expansion, the pia mater, which is immediately applied over the whole surface of the brain and its convolutions.

The great quantity of blood sent to the brain and its coverings, is supplied by the carotid and vertebral arteries, and is again returned by the jugular veins; but before reaching these veins, it is emptied into a number of sinuses or reservoirs, formed by productions or duplicatures of the dura mater: these sinuses all communicate with each other: they are numerous on the back part of the head, but the most material for surgeons to be acquainted with, are, the longitudinal, which runs along the middle and upper part of the head, directly in the course of, and firmly attached to, the sagittal future; and the two great lateral sinuses, in which the longitudinal sinus terminates at the middle and upper part of the cerebellum, at which part these two sinuses commence, the one going to the right and the other to the left, and passing down to the basis of the skull, they there terminate in the jugular veins.

This general account of the anatomy of these parts, will serve to render the consideration of the injuries to which they are exposed more clear and intelligible; while a more minute description of them would not only be incompatible with the nature of this work, but would not in any respect be necessary; for the most minute description that can be given of the different parts of the brain would be of no advantage to practitioners in the treatment of those affections to which it is liable. We may, in general, observe upon this point, that the brain is an organ essentially necessary for life; and, that its parts cannot be deranged, either by wounds, contusions, or compression, but with the utmost hazard: for although we sometimes meet with instances of the brain being much injured, and even of parts of it being discharged at wounds, without any important consequences taking place; yet these are rare occurrences, and are by no means suffi-

cient to invalidate this general observation, that a sound and entire state of this organ is highly necessary for the purposes of life.

I shall now proceed to treat more particularly of the nature of those injuries to which the parts that have just been described are liable ; but instead of enumerating in separate sections, as has commonly been done, the various causes of affections of the head, and the symptoms which each of these excite ; I mean to consider the general effects which they produce upon the brain, and to point out the manner in which they appear to operate, together with the means which from experience have been found to answer best in their removal.

All the symptoms of affections of the brain from external violence seem evidently to originate from one of the following circumstances ; namely, from compression of the brain ; from commotion or concussion ; or from inflammation. These I shall proceed to consider in separate sections ; and as far as the intricate nature of the subject will admit, I shall treat of them as distinct and unconnected with each other : for although we are not to expect that the symptoms arising from these different causes, are always distinct and precisely marked, and without connection with each other ; yet it frequently happens that they are so, and it is in their separate uncombined state only that any description can be given of them. Practitioners of experience must indeed know, that causes frequently occur, by which all the affections of the brain that I have mentioned are induced at the same time in the same patient ; and in such instances, the symptoms which they produce are no doubt so very confused as to be with difficulty distinguished : thus, a stroke upon the head, attended with symptoms of concussion, is frequently accompanied with those which proceed from compression ; and these again are in some instances succeeded by all the symptoms of inflammation.

The appearances induced by the various combinations of these, can be learned only from practice and observation ; but an accurate knowledge of them as they occur in a separate and unconnected state, will prove highly useful in the cure, under whatever form they may occur.

SECTION III.

Of Compression of the Brain from external Violence.

A GREAT variety of symptoms are enumerated by authors, as indicating a compressed state of the brain from external injuries ; but the most frequent, as well as the most remarkable, are the following : giddiness ; dimness of sight ; stupefaction ; loss of voluntary motion ; vomiting ; an apoplectic stertor in the breathing ; convulsive tremors in different muscles ; a dilated state of the pupils, even when the eyes are exposed to a clear light ; paralysis of different parts, especially of the side of the body opposite to the injured part of the head ; involuntary evacuation of the urine and fæces ; an oppressed, and in many cases an irregular pulse ; and when the violence done to the head has been considerable, it is commonly attended with a discharge of blood from the nose, eyes, and ears.

Some of the milder of these symptoms, such as vertigo, stupefaction, and a temporary loss of sensibility, are frequently induced by slight blows upon the head : and as they often appear to be more the consequence of a shock or concussion given to the brain, than of compression induced upon it ; so they commonly soon disappear, either by the influence of rest alone, or of the other means to be hereafter pointed out. But when any of the other symptoms take place, such as convulsive tremors ; dilatation of the pupils ; invol-

untary passage of the urine and fæces ; and especially when much blood is discharged from the nose, eyes, or ears, we may always conclude with a good deal of certainty, that much violence has been done to the brain, and that compression in one part or another is induced upon it.

In the anatomical description of the cranium and brain, I had occasion to remark, that the cavity of the skull in a state of health, is completely filled by the brain, no vacuity whatever being left between them : it therefore necessarily follows, that compression of the brain will be produced by whatever tends to lessen the cavity of the skull.

A diminution of the cavity of the skull may happen in various ways ; by fractures attended with depression of any part of the bones of which it is composed ; by the forcible introduction of any extraneous body through both tables of the bone ; and by the effusion of blood, serum, pus, or any other matter. The same effect may be likewise produced by the thickening of the bones of the head, as sometimes happens in lues venerea, and by water collected in the ventricles of the brain in cases of hydrocephalus internus.

These two last mentioned causes, however, proceed from, and are connected with, diseases which it is not our business in this place to consider. The effusion of pus or any other matter not evidently either blood or serum, must always be the consequence of inflammation, and will fall to be considered in a different section ; and as the introduction of extraneous bodies into the brain must always be attended with a fracture, and commonly with depression of some part of the skull, the consideration of the one is necessarily connected with that of the other. I shall now therefore proceed to speak more particularly of fractures attended with depression, and shall afterwards consider the other general cause of compression of the brain, effusion of blood or serum.

§ 1. *Of Compression of the Brain from Fractures attended with Depression of the Skull.*

FRACTURES of the skull, as I have already observed, have been distinguished by a variety of appellations according to their figure, extent, and other circumstances of little importance: to retain these distinctions, could therefore answer no good purpose; and as it might embarrass the younger part of the profession, I do not mean to mention them.

The only general distinction of fractures necessary for us to retain, is, those which are attended with depression, and those which are not. All the variety of the latter I mean to comprehend under the denomination of fissures; but the consideration of these will be more properly introduced in a different section.

Fractures of the skull may be produced in various ways: by falls from a height; by blows with sharp or blunt instruments; and by missile weapons, such as stones, and balls thrown from a distance.

Authors, who have entered minutely into this part of the subject, observe, that in the treatment of fractures, much advantage may be derived, from a knowledge of these circumstances; and that we may even ascertain with some precision, the degree of violence that has been done to the brain, from being acquainted with the cause by which it was produced.

But although it is proper to inquire into the nature of the cause of every fracture, yet we are not to imagine that any material advantage will be derived from it: we know, indeed, that a fracture of the skull, produced by a blow with an obtuse or blunt instrument, or by a fall from a considerable height, is frequently attended with more alarming symptoms than a fracture of the same extent with a sharp instrument. This, however, is not universally the case; and as it is impossible to ascertain the extent of any injury done to the brain by this circumstance alone, little or no dependence should ever be placed on it.

In the management of fractures of the skull attended with depression, the indications are,

1. To discover as exactly as possible the site, the course, and the full extent of the fracture.

2. To obviate the effects of the injury done to the brain, by elevating or removing all the depressed parts of the bone.

3. To endeavour to complete the cure by the application of proper dressings, and attention to the after treatment.

These are the objects which we ought to have in view. In many instances, indeed, this is put out of our power by the nature of the fracture; but in others, when these indications can be accomplished, we are frequently able to afford more effectual relief to patients, than it is ever in our power to do in the treatment of any other malady.

In fractures of the skull, the teguments covering the injured part of it, are frequently cut, lacerated, or even altogether torn away. In this case, the state of the bone is at once rendered evident; the fracture is immediately discovered, and the surgeon is left at liberty to employ the most proper means for obviating the effects of it: but when the skin and other teguments are entire, it often happens, even when, from a concurrence of circumstances, we are tolerably certain of the existence of a fracture, that we do not easily ascertain it.

When any outward mark of injury takes place, particularly when a tumor is perceived on any part of the head, accompanied with appearances of a recent contusion, the symptoms are commonly found to originate from a fracture directly underneath; and on the bone being laid bare, in the manner to be hereafter mentioned, the course of the fracture is in general discovered.

But every practitioner knows, that injuries done to the head frequently produce affections of the brain, and even fractures of the skull, without leaving either

tumor or any other external mark by which they can be discovered. In this situation, the whole head should be shaved, when it will sometimes happen, that a particular spot will appear red, which could not be observed till the hair was removed, and will thus lead to a discovery of the injured part. But when no tumor, inflammation, or any other mark is discovered, we may in some instances be directed to the seat of the injury, by pressing firmly over the whole head: and if we find, on repeated trials, that pressure excites more pain in a particular part than in others; of which we may be convinced if the patient moans much on pressure being applied to it; and if he puts up his hand or draws away his head; on this trial being repeated, we may conclude with much probability that this is the seat of the injury.

In circumstances, such as we are now considering, so fraught with danger to the patient, and so perplexing as they frequently are to practitioners, nothing that can throw light upon the nature of the case should be overlooked. If the patient raises his hand, and applies it frequently upon or near to the same part of the head, even this will merit attention; for in this manner I have in different instances been led to the site of a fracture.

When therefore the symptoms of a compressed brain are evidently marked, we ought, without hesitation, to proceed to examine the state of the cranium wherever appearances give cause to suspect that a fracture has taken place. We do this by laying the bone bare by making an incision with a scalpel through all the external coverings of the skull.

In performing this operation, when the bone is previously found to be much injured, which in some instances is the case even where the skin directly above it is not lacerated, the incision through the integuments should be made with caution; otherwise the brain may be hurt, either by the knife pressing on some detached portion of bone, or even by the point of it

passing in between two of the separated pieces. But when the bone upon which the incision is made, is not either broken into different portions, or when the edges of the fractured pieces have not receded from each other, and do not in any degree yield to pressure, the division of the skin and other teguments may be then performed with freedom, by cutting through the whole of them down to the bone, with one stroke of the scalpel.

The sole intention of this operation is to bring the injured parts of the bone into view ; but although the means of effecting this should be simple and easy, a very painful and severe method of doing it has been commonly practised. It has been in general supposed, that in fractures of the skull, the injured parts cannot be sufficiently exposed, either for the purpose of tracing the course of the fracture, or for applying the trepan, unless a portion of the skin and other teguments is altogether removed : with this view, some have advised a crucial incision to be first made, and the corners to be cut off. Others recommend an incision of the form of the letter T : while by many we are advised to remove a circular or oval piece of the teguments at once.

Various objections, however, occur to all of these. They not only produce a painful wound, which is commonly difficult to heal ; but by exposing a considerable part of the skull, tedious exfoliations sometimes take place, which might be prevented ; and the covering which nature afterwards provides for the denuded bone never answers the purpose so well as the teguments that were removed. Even all of these objections, however, to the practice that we are now considering, should be considered as trifling, and ought not to be regarded, if we could not by more simple means discover the extent of fractures, and if we could not likewise by the same means apply the trepan, or any other remedy. But as both of these objects can

perhaps in every instance be accomplished in a more easy manner, the other ought to be laid aside.

On a simple incision being made in the manner I have directed, the teguments always retract so much as to admit of the bone being freely examined ; and if a fracture is discovered, the course of it may be always traced with as much certainty by extending this incision along that part of the bone in which the fracture is found to run, as if a considerable portion of the teguments was removed : and this retraction of the divided parts also admits of the application of the trepan.

On the teguments being in this manner divided, if the skull is found to be fractured and depressed, the nature of the case at once becomes obvious ; and the means to be hereafter pointed out for the treatment of fractures attended with depression, should be immediately employed. But even where no outward appearance of a fracture is met with, and where no tumor, discoloration, or other external mark of injury is discovered, if the patient continues to labour under symptoms of a compressed brain ; if the pericranium has been separated from the bone ; and especially if this membrane has lost its natural appearance, and has acquired a pale white or dusky yellow hue ; the trepan should be applied without hesitation at the place where these appearances mark the existence of an injury, for, in this manner alone, blood or serum, which may have been effused, and by which the compression is induced, can be removed : it would, therefore, in such circumstances, be highly improper to trust to the absorption of the extravasated fluids, as by some has been advised ; the chance of a cure from this being very doubtful.

Again, although no mark either of fracture, or any other injury underneath, should appear on the external table of the bone, still it is possible that the internal table may be both fractured and depressed. This is not indeed a frequent occurrence, but yet various

instances of it are upon record : I have met with it in different cases ; and other practitioners, on whose accounts we may place the most perfect confidence, likewise mention it.

I formerly observed that the internal table of the skull is thinner and more brittle than the external : how far this will explain the fact we have just been speaking of, I will not pretend to say ; but this is certain, that the injury done to the brain by the depression of the internal table of the skull, may be as great, and may prove as certainly dangerous, as if the whole thickness of the bone had been forced in. This is therefore another motive for the application of the trepan in all cases, accompanied with symptoms of compressed brain, even where no external mark of depression is discovered.

It will often indeed happen, that no relief will be obtained from the application of the trepan, even where the symptoms are such as proceed from a compressed state of the brain, induced either by a depressed portion of bone, or by extravasation of blood or serum. This want of success from the operation, may proceed from a concurrence of causes that we shall afterwards have occasion to mention : but the most fatal of all of them, is that which we term a contra-fissure, and the French a *contre-coup* ; in which the skull is fractured and sometimes depressed, and blood or serum perhaps effused on the surface of the brain, at a part very distant from that which received the blow, and where alone there is any apparent or external mark of mischief.

Many have doubted the reality of such an occurrence ; for, as we cannot clearly account for it, so it is alleged, that it has rarely, or perhaps never happened. As it is not the intention of this work, to enter upon minute theoretical discussions, I shall not attempt to explain the manner in which contra-fissures of the cranium may be produced : I shall just shortly ob-

serve, that doubts concerning their existence, can have been entertained by speculative writers only ; for every practitioner of experience must have met with opportunities to ascertain the reality of the fact.

I will not pretend to say, that a blow received on one side of the head, will necessarily and certainly produce a fracture or other mark of injury on the opposite side ; neither does it appear that the part exactly opposite to the place where the blow has been received, will suffer more readily than other parts of the head, at the distance of only two or three inches. All I wish to establish is, that the skull may be fractured in parts not immediately contiguous to those upon which blows are given ; and that this sometimes happens where no external mark can be discovered upon the teguments corresponding to the fracture, and while the bone remains perhaps entire on the part which more immediately received the injury.

We shall therefore consider it as matter of fact, that the skull may be fractured in parts at some distance from those which have more directly received an injury ; and some advantage I think may be derived from this being kept in view. In common practice, if no benefit is reaped from the application of the trepan ; if no fracture is discovered of the internal table of the skull, or no extravasation on that part of the brain newly denuded by a removal of a piece of the bone ; and if bloodletting, laxatives, and the other means usually employed, do not remove the symptoms of compression ; practitioners very generally conclude, that they depend either on concussion of the brain, or on extravasation in some of the internal parts of it, where the effects of an operation cannot reach ; and accordingly, the patient is left to his fate, without any attempt being made for his relief.

In this, however, I think we are liable to much just censure and blame : for although a patient in such circumstances is undoubtedly in great danger, and although the chance of his recovering by any means

we can employ, is inconsiderable, yet still he should receive this chance: in such circumstances, no attempt that we can make will add to his hazard, so that nothing should be omitted from which there is the most distant chance of relief being derived.

The head should be again examined with attention; and by pressing firmly, slowly, and deliberately, over every part of it, if even the smallest degree of sensibility remains, the patient will complain, either by moan, or signs with his hands, when pressure is applied to any part that is fractured. I have seen different instances of fractures being discovered in this manner, which, in the ordinary way of searching for them, had been altogether overlooked.

In whatever part of the head the patient complains on pressure being applied to it, the skull should be laid bare by an incision, in the manner I have mentioned. If both tables of the skull are fractured and depressed, the cause of the mischief will thus be discovered: but even although no such depression or fracture should appear in the external lamella of the bone; as there is at least some chance of mischief being met with underneath, either from a fracture of the internal table, or from extravasation, and as nothing can possibly save the patient but the removal of this, the trepan should be immediately applied; and wherever there is the least cause to suspect, either from pain being induced by pressure applied in the manner I have advised, or from any other circumstance, that mischief may be concealed, as long as relief is not obtained from what has previously been done, the operation should still be repeated, as the only means from whence any benefit can be derived.

This, however, leads to a point that merits more extensive discussion; I mean, the effects produced upon the brain by the removal of a portion of the skull with the trepan.

By many of our older writers on this subject, it is said, that much hazard is at all times to be dreaded from this operation ; and in support of their opinion, they not only adduce a variety of facts, but employ much ingenious reasoning on the probable influence of the air finding access to the surface of the brain, an organ which nature has taken particular pains to protect from it.

Practitioners of modern times, however, have adopted a very different opinion upon this point : they even assert, that no danger can ever accrue from the operation of the trepan considered abstractedly ; that it never proves hazardous of itself ; and that it only apparently proves so from being often employed for the removal of symptoms for which this as well as every other remedy is altogether inadequate. In consequence of this, the trepan, in all injuries done to the head, is applied with freedom ; in most instances, probably with much propriety ; but in others, I am convinced, with very dangerous consequences.

My opinion on this important point is, that we should endeavour to avoid both extremes. For, although I clearly think, that the trepan should be applied with freedom wherever it is indicated by symptoms of a compressed brain, and where these symptoms must probably end in death, if the cause which produced them is not soon removed ; yet I am equally satisfied, that it is the presence of such symptoms only which can warrant this operation ; and that it should never be employed, as it too frequently has been, merely with a view to prevent them.

In the one case, no additional risk can be incurred by the trepan ; and as the patient will in all probability suffer if it is not employed, we should not hesitate to advise it : but, as I am perfectly convinced, from attentive observation of the effects of this operation upon the brain, that it is by no means an innocent remedy, and on the contrary indeed, that it is frequently the cause of dangerous symptoms, which otherwise

would not have appeared, I would never think of advising it but for the removal of symptoms already induced ; that are evidently of a dangerous tendency ; and that cannot be obviated in any other manner.

In a subsequent part of this chapter, when treating of fissures, I shall again enter on the consideration of this subject. In the mean time, before describing the operation of the trepan, I thought it proper, in this manner, to mention the opinion I had formed of it.

Having thus considered the first general indication to be kept in view in the treatment of fractures attended with depression of the skull, we now proceed to the consideration of the second, which comprehends the means best adapted for the removal or elevation of a depressed portion of bone. We have already had occasion to see, that there is some variety in fractures attended with depression ; and the means employed for removing them, are likewise various.

It often happens, that the corresponding teguments are either altogether removed by the cause which produced the fracture, or so much lacerated as to admit of the bone being freely examined ; but when they are either not divided in any part, or not in a sufficient degree, the first object of the surgeon, as I have already observed, should be, to get the head shaved, and then to divide the skin and other teguments with a scalpel through their whole extent, and directly upon the course of the injury. If a fracture is discovered, and is found to proceed in a straight line, the incision should have the same direction : or if it takes an angular course, the incision should likewise do so ; for the sole object of the one is to bring the other as completely as possible into view.

In making this incision, one or more arteries are apt to be cut, and they sometimes continue for several hours to discharge freely ; these, we are commonly directed, before proceeding further, to secure with ligatures.

If the patient is weak, or if a sufficient quantity of blood has been already discharged, this ought no doubt to be done: but as the membranes of the brain are commonly much injured by the depressed bone, and as nothing in such circumstances tends with such certainty to prevent inflammation, as a plentiful discharge of blood from the contiguous part; the arteries which have been cut by the incision should be always allowed to bleed in proportion to the strength of the patient, when they will commonly retract, and give no further trouble.

The hemorrhagy from the larger arteries being stopt, the remaining steps of the operation are commonly postponed till the following day, in order to have all the oozing from the smaller vessels removed also: but as soon as the discharge from the principal arteries is over, that which takes place from the rest of the wound should not be regarded; and as it may always be easily stopped, by the edges of the cut being covered with dry lint, and moderately compressed by an assistant, and as the pressure on the brain should always be removed as quickly as possible, the operation ought therefore to be quickly completed.

The extent of the fracture being ascertained as far as it can be done, and the blood from the incision stopped, we are next to endeavour to elevate the depressed portion of bone: the propriety of this, indeed, is sufficiently evident, and it has been admitted by practitioners of every age, although they have differed much in the mode of effecting it.

Surgeons of the last and preceding centuries were in general timid in every operation of importance, especially in such as were performed upon the head: and being commonly averse, as I have already remarked, to expose any considerable part of the brain, they endeavoured to elevate depressions of the cranium, either without penetrating the bone at all, or by means of very small perforations only.

For the purpose of perforating the skull, a kind of circular saw, commonly termed a trepan, and of which I shall give a delineation, was always employed ; but the opening formed by it was so small, that it was necessary to apply it often, even in ordinary cases, to accomplish the views of the operator : many inconveniences ensued from this ; to remedy which, various improvements upon this instrument were suggested, and figure 1. Plate VIII. represents the result of all of them. Thus improved, it removes a much larger portion of bone at once ; and being entirely cylindrical, it penetrates the skull more easily than a conical saw, which, till of late was the only form in use.

In one circumstance, however, modern surgeons have not made any improvement of this instrument : they have rather indeed hurt it materially, by forming it so as to render the operation of perforating the skull with it both more difficult and more tedious than it otherwise might be. The instrument delineated in Plate VIII. cuts the bone not only more quickly, but with equal safety. The timidity of some operators, however, has made them imagine, that it cannot be used of this form, but with the hazard of passing too suddenly through the bone at the end of the operation, by which the brain would be unavoidably injured : they have accordingly invented another, which divides the bone very slowly, and which they therefore suppose will perform the operation with more safety. This instrument is termed a trephine, and is delineated in Plate VII. fig. 1. This, however, is not possessed of any advantage over the other, not even that of being more safe for perforating the bone ; for, the same degree of force must be applied by the operator with each of them ; and it has this very material defect, that it requires more than double the time to perform the same operation that is necessary with the trepan. It has long, however, been almost the only instrument employed for this purpose in many parts of Europe, especially in Britain ; so that prejudice may probably

continue it in use : but whoever will attend to the principles on which the trepan and it are formed, will soon see that the former should be preferred.

When it was necessary to perforate the skull, the trepan, in its then unimproved state, was formerly the instrument chiefly employed. Others indeed were used for the purpose of forming openings in the bones ; but they were so extremely rude and unmanageable, that it is not necessary to describe them ; and this especially as delineations of all of them may be seen in the writings of almost every chirurgical author of the last and preceding centuries.* But, in many fractures and depressions of the skull, it was formerly imagined that the trepan was unnecessary, as it was then generally believed that the depressed parts of it might be raised by more simple means : with this view, some writers proposed to pass a screw in a slow and gradual manner nearly through both tables of the depressed bone, and then to raise it into the place that it formerly occupied, by pulling the screw slowly and firmly upwards : and again in children, in whom the bones are more soft as well as more yielding, and in whom fissures are supposed to occur frequently without fractures, we were advised to cover all the teguments corresponding to the depressed portion of bone, with leather spread with adhesive plaster, and then by means of strings or cords fixed to the back part of the leather to elevate the depression.

Whether a depression ever occurs, however, even in early periods of life, without a corresponding fracture of at least one of the tables of the skull, is much to be doubted. I rather think that it does not, at least I never met with it : and I have seen different instances which previously were supposed to be such, but which, after death, were all except one found to be attended with complete fractures ; and in this the osseous fibres of the internal table of the bone were

* Vide the works of Hildanus, Scultetus, and Dionis.

cracked or ruptured, while those of the outer table remained nearly entire. But whether this kind of depression ever occurs, or not, is not material: the means to be presently pointed out for elevating depressions of the skull will prove equally useful, whether they are accompanied with fractures or not; while I may freely venture to say, that no dependence should in either case be placed on adhesive plasters, as they are evidently inadequate to the effect.

The powers of a screw in raising depressed portions of the skull would often be sufficient, but as it could neither remove any sharp points of bone which might be beat in upon the brain, nor serve to discharge any diffused blood which frequently accompanies fractures attended with depression, this means of removing depressed portions of bone will never probably be adopted. It has commonly, too, been objected to this instrument, that it cannot be introduced but with the hazard of forcing the depressed piece of bone upon which it is applied farther in upon the brain; and therefore that much mischief may thus be induced by it. In many instances, however, the screw might be employed without hurting the brain; for the force necessary to pass forward a screw is inconsiderable; so that unless where a portion of bone is entirely detached from the rest of the cranium, a screw might frequently be inserted into the depressed piece with little or no hazard of forcing it in upon the brain. If therefore the other objections that I have adduced to it were not material, the latter would not be of much importance. And as some practitioners may incline to have it in their power in particular instances to use it, I have thus thought it right to give an account of it.

I shall now proceed to describe the practice of modern surgeons in fractures attended with depression of the skull, together with such improvements as the practice may appear to admit of.

The fractured part of the bone being brought into view by the division of the teguments in the manner I have advised, and the flow of blood being likewise stopped, the exact situation of the depressed part of the bone next requires attention. In some cases we find it entirely separated from the rest of the skull : in others, it adheres at one or two points : whilst in some, a fissure or rent is discovered, with one side of the bone beat down below the plane or level of the other.

When a portion of the skull is broken into several pieces, as they would never probably unite, either with one another, or with the surrounding bones, we are in general desired to remove them : but when only one piece of bone is depressed, and especially if this adheres at a point or two to the contiguous bones, practitioners often attempt to replace it, in order, as they say, to avoid that exposure of the brain which the removal of a large portion of the skull must always occasion ; and they allege as a reason for this, that in some instances it succeeds, by the fractured and depressed piece uniting firmly with the contiguous bone.

It is not, however the unexpected success attending the particular treatment of a few cases by which we are to act : it is the result of general observation only by which our practice should be determined. Whatever may have happened with a few, in their attempts to preserve detached portions of the skull, practitioners of observation will allow, that more advantage is in general to be derived from removing them at once.

It universally happens, when one or more pieces of the skull are either entirely or nearly separated from the rest, that blood in a greater or smaller quantity is effused upon the surface of the brain, or on the dura mater, through the whole extent of the injury ; so that, when a loose portion of bone is allowed to remain, neither this extravasated blood, nor the matter which afterwards forms, can find a free vent ; while the piece that has thus been detached and replaced seldom or never unites to the surrounding bone : by the

early removal of the detached portions of bone, every inconvenience arising from this is prevented; a free vent is thus given to any blood that may be presently effused, or to the matter which may form in future; the state of the dura mater, and even of the brain itself, may be freely examined; while inflammation and gangrene also, to which these parts are liable from fractures of the skull, are thus more effectually guarded against than they could be by any other means.

When the depression is formed by different small portions of bone, the whole of them may for the most part be easily taken out with common forceps; and by removing those portions first, that appear to be most detached, the rest will thus be loosened, and therefore more easily taken away. But it sometimes happens, even when several portions of bone are beat in, and very commonly when the depression is formed either of one piece entirely separated, or of a portion of the skull forced in upon the brain without any of it being altogether detached, that the depressed pieces cannot be either removed, or even raised into a level with the rest of the skull, in any other manner than by making one or more perforations in the contiguous sound bone, for the purpose of introducing an instrument termed a levator, with a view to elevate the depression.

It is for this purpose chiefly that the trepan is employed: hence it is evident, that this operation can never be necessary, when the depressed pieces of bone can be removed in the manner I have mentioned; for the sole intention of it is thus accomplished in a more simple manner. But when the depressed portions of bone are so firmly attached to each other, that they cannot be elevated but with the risk of wounding the brain or its membranes, which in fractures of the skull is very commonly the case, the trepan should without hesitation be employed, and the following is the method of doing it.

In books of surgery, those parts of the skull are commonly pointed out on which this operation may with safety be performed ; and much pains has been taken to ascertain those that we ought to avoid. In practice, however, these limitations are seldom in our power to adopt, as the operation must always be performed near to the depressed portion of bone. But, as it appears from the anatomical description that I have given of the different parts that may be concerned in this operation, that it may not only be performed with more safety in some parts than in others, but with more prospect of advantage, practitioners should be so far directed by this, as to avoid, as far as can be done consistently with the advantage of the patient, all those parts from whence much risk might ensue from a perforation being made in them. The parts which with this view we should avoid, are, almost all the under part of the temporal and parietal bones ; all the under part of the occipital bone ; the inferior part of the frontal bone ; and the whole course of the longitudinal sinus. The internal surface of the greater part of the two first of these bones are furrowed with the large arteries of the dura mater ; a considerable part of the occipital bone is not only very unequal, but various sinuses lie immediately under it ; the frontal sinuses lie in the inferior part of the frontal bone ; and although we know that wounds of the longitudinal sinus do not always prove fatal, yet as it transmits a large quantity of blood, we should at all times endeavour to avoid it : but when the depressed pieces of bone are so situated as to render it impossible to raise them without applying the trepan over these parts, as the patient would in all probability die if the depression was not removed, the trepan should be employed without delay. We are not wantonly and unnecessarily to perforate the skull where parts are situated which it might prove hazardous to wound ; but when the life of a patient depends upon this operation, no practitioner, it is hoped, will ever decline it, when it is possible to perform it.

Of all the situations I have mentioned, the most inconvenient for the application of the trepan, is, the back part of the head upon the occipital bone, and the frontal sinuses immediately above the orbits. Beneath the former, several large sinuses are dispersed, and both the external and internal surfaces of this bone are very unequal. And again, the two lamellæ of the frontal bone are separated so far from each other by the frontal sinuses, and the internal surface of the bone at this part is so very unequal, that no practitioner would make choice of it for the application of the trepan. But cases sometimes occur, in which it is necessary to apply the trepan in both of these situations. Wherever a fracture or any other cause of compressed brain is so situated that relief cannot be otherwise obtained, and where the patient must otherwise die, no difficulty should deter us. The muscles of the occiput may be dissected off from the part where the trepan should be applied; and with care and attention, a perforation may be made even through the frontal sinuses.

The instruments in common use for this operation are the following: a raspator for removing the periosteum, represented in Plate VIII. fig. 3. A perforator, Plate X. fig. 5. The trephine itself, Plate VII. fig. 1. An instrument termed a lenticular, Plate VIII. figure 2. Forceps, Plate VII. fig. 2; and an elevator, represented in Plate XI. figures 1, 2, 3, and 4.

In proceeding to the operation, the patient should be laid upon a table of a convenient height, with his head firmly secured by assistants: this being done, it is the common practice to lay a considerable part of the skull entirely bare round the part intended to be perforated. But this ought by no means to be done; for although it is necessary to remove as much of the pericranium as may admit of the head of the instrument being applied as frequently as it can be needed, yet more should never be removed: tedious exfoliations of the denuded bone are apt to ensue from it;

by which the cure is not only retarded, but much more hazard induced.

We are, therefore, either with a scalpel, or the raspatory, Plate VIII. fig. 3. to separate and remove just as much of the pericranium as will admit of the trepan being freely applied, and no more; and the part at which this should be done, ought to be exactly at that point where the greatest resistance seems to be to the elevation of the depressed piece of bone. With the view also of deriving every advantage from the perforation, it ought to be so formed as to include not only the fracture or fissure, but if possible a small portion of the depressed piece. The weight and pressure of the instrument during the operation, ought no doubt to rest chiefly on the sound undepressed bone, as much injury might be done to the brain, by making it press much upon the depressed portion of bone: but it very commonly happens, that a small segment of the opening may be made with perfect safety upon the depressed bone; and as the advantages that result from this in the subsequent steps of the operation, are considerable, it ought in every instance to be done.

The pericranium being removed, a small hole should be made in the undepressed bone, with the perforator, Plate X. fig. 5, care being taken, as I have already observed, to have it so near to the fracture, that the head of the trepan may include a portion of the depressed piece. As soon as the hole is sufficiently large for receiving the point of the pin in the centre of the circular saw, it ought to be inserted into it, by which the saw is firmly preserved in one place, till several turns being made with it, an impression of a sufficient depth is formed in the bone for retaining it, when the pin should be removed: for by projecting past the edge of the saw, it might injure the membranes of the brain before the perforation is finished; and as the sole purpose of the pin is to fix the instrument during the first part of the operation, it becomes

unnecessary as soon as a cut is formed in the bone sufficient for retaining it.

The surgeon should now proceed to finish the perforation by pressing on the instrument with moderate and equal firmness; for if more pressure is applied to one side than another, the division of the bone will be completed at unequal periods, which ought to be carefully guarded against. If the trephine is employed, all the force necessary for turning it is applied by one hand of the operator; the saw is made to cut by forming only a half circle or scarcely so much; and the perforation is finished by moving the saw backward and forward, till the whole thickness of the bone is divided: but in using the trepan, the surgeon applies the pressure upon the head of the instrument with one hand, while he turns the handle with the other. Some operators indeed make the pressure with their forehead or chin; but it is both more easily and more equally applied with one hand. With the trepan the saw is made to move always in the same direction, by which it cuts more easily, and performs the operation in a third part of the time required with the trephine. When one perforation is sufficient, this is not indeed an object of much importance; but as several perforations are not unfrequently necessary, and as the operation becomes thereby tedious, both to the operator and the patient, that method of operating ought certainly to be preferred, which renders the means of cure more easy, provided it is equally safe. Now, it is obvious that the trepan is wrought with more ease than the trephine; and whoever has seen the operation done with both instruments, will confess that it likewise does it with equal safety: for in the hands of those accustomed to use it, there is no more risk of wounding the brain, by passing too suddenly in upon it with this instrument, than with the trephine. If the surgeon is cautious, there is no hazard of this with either of them; while, if not sufficiently attentive, the trephine will produce as much mischief

as the other. Besides, in using the trephine, the head of the patient is apt to be much jolted by the unequal motion of the instrument, by which much uneasiness is produced in the mean time, while it also serves to promote that tendency to inflammation in the membranes of the brain, that is apt in every instance to occur from a portion of the skull being forced in upon them.

Some practitioners, very sensible of these advantages of the trepan, but dreading the risk of its passing too suddenly in upon the brain, commence the operation with this instrument, and finish it with the trephine :* this is far preferable to the usual method of performing the operation entirely with the trephine ; but those who have fully experienced the advantages of the trepan, will employ it for the whole operation.

But whichever of these instruments are employed, the operator should proceed with great steadiness, and with as equal a degree of pressure as possible till the perforation is finished. For this purpose, the instrument should be frequently taken out, and the depth of the cut examined by introducing the point of a probe or sharp pointed quill in the form of a tooth-pick : if the perforation has to go deeper in one part than in others, care should be taken to alter the pressure so as to carry on the cut of an equal depth to the last.

At each removal of the instrument, while the surgeon endeavours to discover the depth of the cut, and to clear it of blood and particles of bone, an assistant should have the charge of cleansing the saw with a small brush ; or, there may be two instruments with the saws exactly of the same size, so that while one is employed by the surgeon, an assistant may be cleaning the other.

* This, I believe, was first suggested by our present celebrated Professor of Anatomy, Dr. Monro, to whose ingenuity, surgery, in many points of importance, is much indebted.

When the instrument has reached the diploë, attention to the frequent cleansing of the saw becomes more especially necessary, as the blood discharged from this part of the bone, and from the spongy cancelli of which it is made, if not often removed, tends considerably to obstruct the operation: but we should not expect always to meet with the diploë; for it is wanting in some parts of the skull, and becomes less in every instance by age. The general direction, therefore, given for performing the first part of this operation freely and speedily till the diploë appears, cannot with safety be admitted: every step of it should be done, as I have said, with steadiness; but with such caution, as to prevent every chance of the brain or its membranes being injured by the instrument being pushed forcibly in upon them.

But if caution is necessary in the first part of the operation, it afterwards becomes much more so: so that in proportion to the progress of the saw, it should be more frequently removed; and as soon as the point of a probe, or sharp quill, can pass entirely through at any part of the cut, the pressure should be removed from this point, and equally applied over the remaining uncut part of the bone. By proceeding in this cautious manner, the bone soon becomes loose in different points; and on this being discovered, it may either be taken out with the forceps represented in Plate VII. fig. 2, or the points of two levators being insinuated into the bottom of the cut formed by the saw, one on each side of the piece to be removed, it may in this manner be easily and safely taken away.

I here think it necessary to remark, that practitioners are apt to be too anxious about the total separation of the piece of bone with the saw, before any attempt is made to remove it, from a fear of injuring the dura mater, if any splinter is left: that this may be avoided, they proceed with the saw till the bone is entirely separated; and in order to bring it out with

the last application of the instrument, the head of the saw, till lately, has always been of a conical form, by which the piece of bone is very commonly taken out along with it.

But, however plausible these reasons may appear, the practice ought not to be adopted; for it rarely or never happens, that the piece of bone taken out by the trepan is of an equal thickness in every part; so that if the saw is made to divide one side of it long after the other is cut, the dura mater immediately under the part that was first divided would be hurt by the teeth of the instrument, notwithstanding all the caution that could be employed: of this I have seen such a number of instances, even in the hands of expert surgeons, that I have no hesitation in advising the practice to be avoided. In various cases, indeed, where the operation has been supposed to be very properly performed, the mark of the saw has, after death, been evidently discovered on the dura mater over the whole circle of the perforation. Instead of proceeding with the saw, therefore, till the piece of bone is entirely separated, it is always safer to force it out in the manner I have mentioned as soon as it is discovered to be loose at different points; and even where some small fragments or splinters of bone are left, no disadvantage ensues, as they are easily removed with the common forceps, without hurting the dura mater.*

* As the practice of taking out the circular piece of the skull entirely with the trepan, always appeared to me to be hazardous, I decidedly said so in the first editions of this work. The same remark has probably occurred to others, and Dr. Monro, I find, has long taken notice of it in his class.

With a view to prevent the brain from being injured, after the trepan has passed through one part of the skull, while the operator is employed in cutting the rest, it has been proposed by Dr. Douglas, a physician of eminence in Kells, to have one of the heads of the trepan exactly the size of the others, but with teeth only on one side, by which the operation may be finished with more safety than in the manner in which it is usually done.

In addition to what I have said of the form of the saw, I may remark, that the cylindrical shape is in every respect preferable to the conical, which in some parts of Europe is still retained. I have already observed, that it is not by the form of the instrument that the dura mater and brain are to be avoided, but by proceeding through every step of the operation with due caution; and while the conical saw is not necessary for removing the piece of bone newly divided, it does not penetrate the bone with the same ease as a cylindrical saw, neither is the piece which it takes out so large, unless the size of the instrument is much larger than any that has yet been employed.

This circumstance, of the size of the opening made by the trepan, is an object of much importance, and therefore merits particular attention. For, as the intention of perforating the skull, is to relieve the brain from a state of compression, produced either by depression of the skull, or extravasation of blood or some other fluid; as this is much more effectually done by a large than a small opening; and as the pain and hazard of the operation are the same in both, a large opening should always be preferred. The perforation made by the trepan should never in an adult be less than an inch in diameter.

The piece of bone being removed, if any splinters or points are found to remain, they may be taken out with forceps, or with the lenticular, but the latter is seldom necessary: this being done, we proceed to the main object of the operation, and endeavour to raise the depressed portion of bone.

If the elevation of the depressed bone has been prevented, merely by being firmly wedged at one point; and if the trepan has been made to include this point, as it ought always to do, the whole piece, as it is thus entirely or nearly separated from the rest of the skull, may be now easily removed with the forceps; or if it still adheres firmly at other parts, the trepan must be

again applied at each of these before any attempt is made to remove it. But when the depressed portion of bone is not so much separated from the rest as to admit of being easily taken out, our next object is to raise it into a level with the rest of the skull. With this view, the point of a levator should be introduced at the opening newly made, and being pushed in below the edge of the depressed bone, if it be not firmly wedged in, it may be easily raised by moderate pressure on the other end of the levator. But when the depressed piece is either of considerable extent, or gives much resistance at one or more points, before any attempt is made with the levator, the trepan should be applied again wherever it may appear to be necessary; and by a proper use of the levator at these different openings, it will then be easily raised.

The levator in common use, is not the instrument that I wish to recommend: for being made to rest on the opposite side of the perforation, all the pressure employed for elevating the depression falls on the contiguous parts of the skull, by which much violence is often done to it; and as the same intention may be accomplished in an easier manner, the other should be avoided. By fixing the levator on a pin, supported by a small frame upon two feet, and this frame being placed at a proper distance from the wound, the pressure which it makes, falls on a sound part of the skull, by which no harm can be done by it, while, from its simplicity of construction, it is easily applied, and readily moved from one part of the head to another. The instrument to which I allude is nearly the same with the levator of the celebrated Mr. Petit of Paris, and it is represented in Plate XI. fig. 3.

As the great object of this operation is to remove the depressed portion of skull, together with every other cause of compression that is met with, I have taken different opportunities of pointing out the necessity of this being kept always in view. For if any portion of bone is overlooked, and should be allowed

to continue to press upon the brain, little or no benefit would ensue from the rest of the operation; the patient would continue in nearly the same degree of hazard; and after death, the operator would be highly mortified to find, that with further attention, the life of his patient might probably have been saved.

At the same time that care is thus taken to elevate the depressed pieces of bone, the removal of any blood or serum from the surface of the dura mater, is equally necessary; and if any sharp pointed instrument, pieces of stone, or other extraneous bodies, have been any where forced in upon the brain, I need scarcely observe, that these must likewise be removed; and this being done, the sore should be immediately dressed, and the patient laid to rest.

We meet with much variety in the directions given both by ancient and modern practitioners for the dressing of sores after this operation. With a view to preserve the dura mater and brain from mortification, various antiseptic applications have been recommended, and dossils or syndons covered with ointments are desired to be introduced, not merely into the perforation formed by the saw, but to be pressed as far as possible in between the skull and dura mater. The impropriety, however, of this, must at once appear obvious from the slightest attention to the effects of it. The sole object of the operation is to remove compression from the brain; now the dressings that I have mentioned, namely, dossils of lint crammed into the different perforations, must evidently counteract this, not only by the pressure which they produce, but by serving to prevent that free discharge of matter after the operation, upon which the safety of the patient in a great measure depends. Instead of this, the dressings should be of the mildest kind, and as loosely applied as possible. Dry lint is commonly employed; but it excites less irritation, and is more easily removed, when thinly spread with a simple liniment of wax and oil; and no detriment ensues, as some have imagined,

from the application of unctuous substances to the brain. No tent or dossil, as I have just observed, should be inserted into the perforation ; all that is necessary is to apply as lightly as possible over the fore, a pledget of soft lint spread with an ointment such as I have mentioned ; and this being covered with a thin cushion of soft tow, the whole should be retained with a common nightcap, made so as to tie below the chin, to be either pinned or tied of a proper tightness, on the fore or back part of the head. This supports the dressings with sufficient firmness ; and it neither keeps the head too tight, nor prevents a free flow of matter from the fore, an inconvenience very apt to occur from the use of those bandages commonly employed after this operation.

The patient, on being removed to bed, should have his head placed in such a manner as to prevent the fore from being hurt ; while his position ought also to be such as will most effectually tend to discharge any matter that the fore itself may afford, or any blood or serum that may ooze from the surface of the dura mater.

When the symptoms under which the patient has laboured have arisen entirely from a depressed portion of bone, and when this depression has been completely removed, we commonly find that immediate relief is derived from the operation. From being perfectly torpid, with a deep laborious breathing, and a considerable dilatation of the pupils, the patient becomes less stupid and lethargic. He begins to toss about in bed ; to raise his eyelids ; and to make some feeble attempts to speak : his breathing becomes less oppressed, and the pupils contract when exposed to a strong light. But although all these favourable circumstances do not appear immediately after the operation, we are not to despair of success ; for when the brain has been long compressed, it does not always recover its functions immediately on the cause being removed by which the compression was produced : and, besides,

it often happens, that together with a fracture and depression of the skull, the brain has received a violent shock or concussion ; in which case, as the symptoms do not depend entirely on the compressed state of the brain, so it is reasonable to suppose, that other means must be necessary for their removal, after every cause is taken away by which compression could be produced : with the aid of these, which hereafter we shall have occasion to consider, the most alarming symptoms are frequently removed at last, which resist for a considerable time the most powerful remedies we can employ.

A surgeon ought not therefore to imagine that all his business is over when the operation is finished ; for this may be done in the most complete manner, and yet the patient will certainly die unless other means are employed for his relief : when the symptoms for which the trepan was applied, become less violent on the depression of the skull being removed, and if the patient in the course of a few hours becomes still more relieved, there will be much cause to hope that he will recover without any other remedy being employed ; and that quietness, keeping an open belly, and avoiding every cause of inflammation, will at last prove sufficient for the cure : but when the reverse of this takes place, when the symptoms remain equally formidable after the operation as they were before, and especially if they do not become more moderate in the course of a few hours after the patient is laid to rest ; remedies of a different kind become necessary.

As the symptoms which in such circumstances are most to be dreaded, originate from two different causes, and as the choice of remedies to be employed for its removal should depend entirely on its real nature, it ought in every instance to be ascertained with as much accuracy as possible.

The causes to which I allude, are, inflammation of the membranes of the brain, and concussion of the brain itself.

In general, the symptoms which prevail here, are all suspected to proceed from the same cause; they are supposed to be entirely of the same kind, and the same set of remedies are therefore commonly employed in the cure. The impropriety of this, however, is obvious: for although it often happens, that the symptoms are of a mixed nature, and depend so much on a concurrence of both the causes I have mentioned, that they cannot be rightly distinguished, yet in various instances it is otherwise; and when an evident distinction is perceived, much advantage will accrue, from practitioners directing their attention towards it.

After all the evident causes of compression are removed, if the pulse is slow and soft, if the patient remains torpid, and especially if the pupils do not contract on exposure to a strong light, there will be much cause to suspect that commotion or concussion of the substance of the brain has taken place: for although all of these symptoms are occasionally induced by a compressed state of the brain, yet we know that they are likewise the frequent consequences of concussion: so that, when all the depressed bone and other obvious causes of compression are removed, we conclude with much probability, that any symptoms which remain, when they are such as I have mentioned, depend more upon concussion than on any other cause.

But when, instead of these symptoms, there is, along with some return of sensibility, as is indicated by the patient's becoming unmanageable, and often moving from one part of the bed to another; if the pulse is firm, full and quick; if the eye is found to be inflamed, and especially if the pupil is observed to contract more than usual, and the patient to withdraw his head on the eye being exposed to much light; there will be much cause to suspect that inflammation of the membranes of the brain has taken place. Indeed the dura mater, like every other membrane, is so susceptible of inflammation, that it is difficult to imagine how any part of the skull can be beat in upon it, without

irritating and inflaming it in a remarkable degree ; and if once inflammation is induced upon part of this membrane, we know from experience that it readily and quickly extends over the whole of it ; a circumstance that easily accounts for the high degree of inflammation, which is often observed in the eyes, as likewise for the contraction of the pupils, and severe degree of pain which exposure of the eyes in this situation to much light never fails to produce.

When the symptoms proceed from inflammation alone, the pulse, as I have observed above, differs materially from the pulse of a person suffering merely from concussion of the brain. In a state of concussion, the pulse is full, slow, and soft ; but when inflammation takes place, the pulse, although frequently full, has a firmer stroke, and is commonly quick and hard : and in this case the breathing, although not oppressed and laborious as it frequently is when the brain is compressed, is always more frequent than natural ; a circumstance not commonly observed in patients labouring under the effects of concussion.

Although, for the reasons that I have given, it may often be difficult or even impossible to mark the existence of these different sets of symptoms, yet an attentive observer will frequently be able to distinguish them ; and whenever it can be done, much advantage may be derived from it.

Practitioners of every age have advised in injuries done to the head, to discharge a good deal of blood ; and there is reason to think that no general rule had ever a better foundation : but from attentive observation of the effects of bloodletting, I have cause to imagine that surgeons of modern times frequently carry it too far. Where the membranes of the brain are really inflamed, the propriety of discharging much blood is obvious, and will not be disputed ; but whenever there is reason from the nature of the symptoms to imagine that they proceed from concussion, bloodletting, if recommended at all, should be practised with much caution.

Although the general structure of the brain with respect to its figure, size, and other circumstances, has long been well known ; yet it must be confessed, that our anatomical knowledge of this organ is still very deficient, nor have we the most distant idea of the manner in which it performs its various functions. Indeed our knowledge of this part of anatomy is so very lame, that we are frequently perfectly unable to discover, by the most minute dissection, any difference between the brain in its soundest state, and that state of it in a person evidently killed by a fall or blow upon the head, and in whom all the symptoms induced by the accident were such as indicated an affection of the brain alone. This is particularly the case in those who die from what is termed concussion or commotion of the brain. In such instances the brain we suppose to be somehow or other deranged ; but it most frequently happens, that the most accurate dissection cannot discover the nature of this derangement, nor in what it consists.

From this it is obvious, that the effect of concussion of the brain is not an excitement of inflammation ; for every stage of inflammation becomes obvious to dissection, and can scarcely indeed escape notice. Now, as it often happens in those whom we suppose to have died from concussion, that no appearance of inflammation in any part of the brain is discovered, it is not unfair to conclude, that the effects of these two causes, inflammation and concussion, are distinct, and perhaps very opposite in their nature and effects.

From the circumstances I have mentioned of the effects observed upon dissection to arise from these causes, and of the symptoms induced by the one being different from those which arise from the other, the conclusion I have formed with respect to their difference, might even upon these grounds be supposed to be well founded : but it is not on speculation alone, that I wish to rest either this or any other opinion of practical importance. The idea was first suggested by

the different effects which I had observed to proceed from bloodletting in affections of the brain produced by external violence. In many, great advantages ensued from it, while no benefit was procured from any other remedy : but in others, instead of benefit being derived from it, the patients became obviously worse after every repetition of the operation. The pulse, from being full, gradually became weaker ; and the strength of the patient commonly sinking in the same proportion, he seldom recovered from the effects of bloodletting, whenever it was practised to any considerable extent.

From these circumstances I have been led to think, that concussion of the brain operates upon the system, in nearly the same manner with syncope induced by fear, inanition, or any similar cause, in the treatment of which, bloodletting is known to prove hurtful.

In what manner a blow upon the head or a fall from a height, in a full habit of body, and in a person otherwise in perfect health, who only a few minutes before could have supported the loss of much blood, should be able instantly to induce such a state of the system as cannot admit of this evacuation, I will not pretend to say : but that it frequently happens, I am now from repeated observations entirely convinced ; and whoever pays due attention to this branch of his profession, will find that it is so. He will find, indeed, that all such symptoms as arise from inflammation, are more effectually relieved by bloodletting than any other remedy : but he will for certain observe, that all of those which do not depend upon this cause, and which arise solely from concussion, instead of being relieved by this remedy, will be uniformly rendered more obstinate and more alarming, in proportion to the quantity of blood that is taken away.

So far, however, as my experience goes, the evacuation produced by purgatives never proves so debilitating as to render them improper : and as they have frequently an influence in relieving the head, they

should never be omitted, and should always be prescribed in such doses, and these as frequently repeated, as the strength of the patient will permit; but they should never be carried so far as to run any risk of inducing debility and languor.

In the following sections, I shall have occasion to enter on a more particular consideration of the symptoms induced by inflammation of the membranes of the brain, and by concussion of the brain itself; but these general remarks upon the subject, appeared to be necessary here, with a view to explain the nature of our practice in the treatment of those symptoms which proceed from either of these causes, when connected with a compressed state of the brain, and when accordingly, the operation of the trepan is not found to afford such complete relief as it otherwise would do. Postponing, therefore, a particular detail of the remedies to be used in cases of inflammation and concussion of the brain, I shall now shortly remark, that whenever the operation of the trepan fails in relieving the symptoms for which it is employed, as this gives reason to believe that they proceed from one or other of these causes, we ought in the most particular manner to discriminate between them. When inflammation is found to have taken place, bloodletting, both general and local, becomes requisite, together with smart purgatives, mild sudorifics, and a strict attention to an antiphlogistic regimen: but when the symptoms appear to arise from concussion, the only evacuation that can with propriety be advised is gentle purging; for in this case, as I have already remarked, and as I shall afterwards endeavour more particularly to shew, bloodletting, instead of proving useful, very constantly does harm.

In both situations, as well as in every other requiring the trepan, the patient should be kept perfectly quiet; little or no light should be admitted to his apartment; any food he is able to take should be of

the mildest kind, and plenty of whey or any other diluent drink should be allowed.

In the mean time, the state of the wound requires particular attention ; for after the operation of the trepan, the membranes of the brain are not only liable to inflame, but to become gangrenous. In wounds of other parts of the body, we know that nothing so certainly prevents inflammation and gangrene, as a free suppuration being induced upon the injured parts ; and whoever will prosecute this practice in wounds of the head, will find, that although from the nature of the parts that have suffered, it may not prove equally useful, that it will, however, answer better than any other that has as yet been employed.

With this view, warm emollient poultices and fomentations should be applied over the dressings, and renewed every two or three hours ; which soon tends to promote a plentiful flow of matter from the perforations in the skull, by which the tension is soon removed, at the same time that the other symptoms are rendered less violent.

At every dressing, the matter resting in the perforations should be removed with a piece of soft sponge or lint, and thereafter the sore should be speedily covered with a pledget of any mild ointment.

When the cure goes properly on, granulations soon appear upon the dura mater as well as on the rest of the wound ; and these continuing to advance, the different openings made by the trepan are at last completely filled up, and the whole being brought to a level with the rest of the teguments, a cicatrix is thereafter obtained by the same means that prove successful in other parts of the body, and of which I have already given a detail.*

These granulations however, which in general arise from the dura mater only, and not from the brain itself, as has commonly been supposed, instead of mere-

* Vide Chapter IV.

ly filling up the openings in the bone, in some cases push out beyond the surface of the teguments, so as to form distinct pendulous tumors.

These tumors or excrescences, when they become large, prove sometimes troublesome, and various means have been proposed for their removal. Being commonly considered as productions of the brain itself, much caution has prevailed in remedies that have been employed for them. Compression is most frequently advised. In some instances they are kept down with escharotics, and in others with strong caustic. Some have proposed to remove them with ligatures, and others by excision.

Of all these modes of treatment, that by compression is most to be dreaded, and ought certainly to be exploded: for whether the tumors arise from the brain or dura mater, pressure cannot be applied to them without affecting the brain; and we commonly find, that even the slightest degree of it induces headach, sickness, and in some instances convulsions. It ought not therefore in any case to be advised.

These tumors are of various degrees of sensibility. In some, they are painful, and cannot bear to be touched; whilst in others they are almost destitute of sensibility. In this last case, the most effectual treatment is to touch them daily with lunar caustic, or calcined alum, and when the tumor hangs by a small neck, it may with safety be removed with a ligature.

We seldom, however, find it necessary to employ any of these means; for in general the tumors begin to diminish as soon as the soft granulations in the perforations of the skull begin to acquire a firmer consistence; and by the time the ossifying process of this substance is completed, they commonly drop off solely by the pressure which this never fails to produce. We should not, therefore, in any case, proceed quickly to remove them; but when they do not fall off on the different perforations being filled with bone, as the connection between them and the brain is then in

a great measure cut off, they may accordingly be removed with more safety, either by excision, caustic, or ligatures.

The cure being thus far complete, if the method that I advised was adopted, of saving all the skin and other teguments, a narrow cicatrix only will remain, and the parts will be nearly as firm as they were before: but when much of the skin and muscles have been destroyed, as these parts are never renewed, the bone will be left covered by a thin cuticle only, with perhaps a very small proportion of intermediate cellular substance; in which case a piece of tin or lead, lined with flannel, should be fitted to the part, with a view to protect it from the effects of cold and external injuries.

When the symptoms arising from injuries done to the head, proceed entirely from a depressed portion of bone acting as a cause of compression upon the brain; if this can be removed, a due perseverance in the plan of management that I have proposed, will in general answer. I must, however, allow, that they do not end in this favourable way so frequently as we could wish: for, along with the depression of the skull, we often meet with symptoms, as I have observed above, either arising from concussion, inflammation, or gangrene; circumstances at all times attended with uncertainty, and commonly with much hazard.

We now proceed to consider the other general cause of compression of the brain, namely, extravasation.

§ 2. *Of Compression of the Brain from Extravasation.*

By whatever cause the brain may be compressed, the symptoms that ensue are nearly the same; and as these have already been minutely considered, it will not be necessary to enumerate them again. I shall only observe, that all the symptoms arising from a

compressed state of the brain, are induced with equal certainty, and attended with as much hazard, from effusions of blood, serum, or pus, as from the most extensive depressions of bone. Those symptoms indeed that occur from extravasation are more to be dreaded than depressions of great extent; for when a depressed portion of bone is large, the seat of the injury is for the most part easily known, and by proper means may often be removed; but where extravasation takes place, our means of ascertaining the seat of the injury are more uncertain, so that the effects of our remedies are less to be trusted. When indeed the brain is compressed by a complication of these two causes, a depressed portion of bone, and extravasation of blood or serum, the seat of the one is readily discovered by that of the other; but when compression is formed by extravasation alone, it is always difficult, and often impossible, to discover the seat of it.

A complication of these two causes is by no means uncommon; for extravasation of blood or serum is a frequent effect of fractures or depression; but we likewise meet with instances of both being effused on the surface of the brain, without any injury being done to the bone.

In compression of the brain from extravasation, we have the same object in view, with that which a depressed portion of the skull renders necessary: having endeavoured to ascertain the seat of the injury, we are to make one or more perforations, in order to discharge the extravasated fluid, and this being done, we are to guard against any effects which the operation might produce upon the brain and its membranes.

It sometimes happens, that the part in which the collection is seated, is pointed out by the mark of a blow or bruise; and on the bone being laid bare, a fissure will in some instances be found in it, while in others no other injury is discovered, farther than a separation of the pericranium from the surface of the bone.

When any of these circumstances, however, take place, we should consider the seat of the injury to be so far ascertained as to have no hesitation in fixing upon this spot for applying the trepan; but, in some cases, no external mark of injury is discovered: even after the whole head is shaved, and minutely examined, the skin will in various instances be found perfectly sound, without any appearance either of tumor or discoloration.

Hitherto it has been held as an established maxim, never to apply the trepan in compression of the brain from external violence where there is no external mark to point out the seat of the injury, the result of the operation being in such cases always uncertain: but as compression of the brain, if not removed, must soon terminate in death, and as it cannot be removed in any other way than by perforating the skull, in such circumstances, to leave any thing undone which would give even the smallest chance of saving the patient, shews a degree of indifference not in any other instance met with in the surgery of modern times. It is with truth indeed said, when no external injury takes place, that there is always much uncertainty of any perforation we can make being to fall upon the spot where the cause of compression takes place; that as the symptoms induced by concussion, are often highly similar to those arising from compression, much dubiety must occur from our not being able to say with precision, whether the symptoms depend upon one cause or the other; and it must be confessed, even where the symptoms have previously been supposed to arise from compression, that in many instances no vestige has appeared on dissection, either of depression of the skull, or of effusion of blood or serum.

All this I shall admit; but to what does it amount? why, to no more than this: that where a patient is evidently in much danger, and is to die if means are not employed for his relief, wherever there is much

uncertainty in the effects of these means, that it will be better not to advise them, but rather to leave the patient to his fate ! As long as the state of a person in this situation affords cause to hope that he may recover by other means, it would no doubt be improper to employ the trepan ; or if much additional risk was to be incurred by the operation, no practitioner of character would advise it with so little probability of any advantage being to arise from it.

But as a patient labouring under the symptoms I have described, cannot be relieved by any other means, and in such desperate circumstances as no additional hazard can be incurred from an operation, we ought certainly, in justice to the patient, to his friends, and to our own reputation, to advise it. The chance resulting from it, will not indeed be great ; but being the only means from whence safety can result, by employing it lives may be saved which otherwise would be lost ; and if a prognosis sufficiently guarded is given, no just blame could fall either upon the operator, or on the art. If the friends of the patient should be told of the hazard he is in ; that he may, however, have some small chance of recovering, if the trepan is applied ; even under this doubtful prognosis, they would in a great proportion of cases wish to have it done ; and however unsuccessful it might prove, and although no extravasation, or other cause of a compressed brain, should be met with, a prognosis of this kind would in every instance screen the operator from blame : and having thus done all that could afford any chance of his recovering, the friends of the patient, as well as the surgeon himself, would surely have more cause to be satisfied than if no attempt had been made for preserving him.

I shall therefore suppose that the trepan is to be applied for the removal of symptoms arising from a compressed state of the brain ; but where no external mark indicates the particular seat of the injury, it may be asked in what manner are we to proceed ? As the

cause of compression may exist just as readily in one part as another, it may seem to be a matter of little importance in what part of the head the first perforation is made. This, however, is far from being the case: for, as we are supposing the compression to be induced by blood or serum, and as these, while in a fluid state, are always passing as much towards the basis of the brain, as the intimate connection between the dura mater and the internal surface of the skull will permit; it will be proper to form the first perforation in the most inferior part of the cranium in which it can with any propriety be made, and to proceed to perforate every accessible part of the skull, till the cause of compression is discovered. For this purpose there is no necessity, as I have already observed, to remove any part of the integuments: wherever we mean to perforate the bone, if an incision is made through the skin, muscles, and pericranium, they will retract sufficiently for admitting the instrument; and this being all that is necessary, more should not be done. If we are at last so fortunate as to meet either with blood or serum, much care should be taken to discharge it; for which purpose, as blood, when coagulated, frequently adheres to the dura mater, instead of one perforation, two, three, or more should be advised, so as to admit of all the extravasated blood being removed.

But in such circumstances the operator should likewise recollect that the blood, instead of being effused on the surface of the dura mater, may be collected within the cavity of that membrane; or it may even be contained within the pia mater, in immediate contact with the brain. For which reason the state of the dura mater should be examined with attention, after every perforation. If it is found to be of its natural colour, and not more tense than it ought to be, nothing farther should be done; but if very tense and elastic, and especially if it has that dark or livid appear-

ance which indicates the probability of blood being collected beneath, it ought undoubtedly to be opened, in order to discharge it. The best and easiest mode of doing this, is to scratch a small hole by repeated strokes with a lancet : this being done, and the point of a pair of curved scissars being introduced beneath the dura mater, the opening may thus be enlarged to the full extent of the perforation in the bone ; or if one cut across the perforation is not sufficient for discharging the blood beneath, a crucial incision may be made, and, if necessary, the corners thus produced may be cut off.

Although I would not recommend the division of the dura mater, where not necessary for the safety of the patient ; yet, in every instance where the operation of the trepan is advisable, if, on perforating the bone, there is reason to suspect that a fluid is collected either between this membrane and the pia mater, or even below the pia mater itself, as the intention of the operation would not otherwise be fulfilled, the collection, of whatever it may consist, ought immediately to be discharged : in such circumstances, unless we go this length, we in fact do nothing : for the dura mater is so thick and strong, that any blood or matter collected between it and the brain, would more readily spread inwards, than burst out through the different layers of this membrane.

To this practice it has been objected, that few have recovered where it has been carried into effect ; that there is a risk of fatal hemorrhagies being induced by it ; and that the brain is apt to protrude at the perforation in the bone, after it has lost the support of its surrounding membranes.

That few have recovered by this means, I will allow : but this does not proceed so much from the opening made in the dura mater, or from this part of the operation being particularly hazardous of itself ; but, from the cause for which it is employed being productive of such danger as puts it out of the power

of art, either by this or any other means, to obviate the fatal effects of it.

With respect to hemorrhagies being apt to ensue from this practice ; although I have seen the dura mater opened in several instances by others, and have different times done it myself, I never knew an instance of its doing harm, not even when any of the sinuses have by accident been laid open ; and although the brain will no doubt protrude more readily when the dura mater is divided, than it otherwise might do, yet this we know is a frequent occurrence in every wound where much of the cranium is removed, and that considerable portions of the brain have been even discharged by wounds, without any material harm being done by it.

The result, therefore, of all that can be said upon this point, is, that where the intention of the operation is fully answered by perforating the cranium ; where any portion of bone that has been depressed is thus completely removed ; or where any pressure produced upon the brain is found to proceed from blood or serum on the surface of the dura mater ; as in any of these cases the cause of danger can be removed without penetrating this membrane, it ought not by any means to be done : but whenever the bad symptoms which have prevailed are not relieved by the perforation of the bone ; or by the removal of an effused fluid that may be met with on the dura mater ; and when from the appearance of this membrane there is cause to suspect that a fluid is collected beneath ; it ought undoubtedly to be opened. Even although the inconveniencies resulting from it were greater than they have ever been, when the life of a patient appears to depend on it, something ought to be hazarded : but we have seen the risk attending this part of the operation is of little importance ; so that I would consider any practitioner as culpable who would advise it to be omitted, when a patient in these circumstances has not been relieved by the previous steps of the operation.

In this situation our views should be exactly such as ought to direct us in the treatment of abscesses in other parts of the body. When a patient is suffering with matter collected in a particular part, no surgeon of experience will be deterred from going to the full depth of the collection merely from finding that it is more thickly covered than he had reason to expect before the skin and cellular substance were divided. He will proceed more slowly and with much caution; but he will at last reach the seat of the matter with as much certainty as if it had been more superficially situated.

In like manner, when there is cause to imagine, that matter is collected beneath the membranes of the brain, an incision should for certain be made through them. No additional risk can be incurred from it: some few may be saved by it; and at any rate, it must always afford satisfaction, not only to the friends of the patient, but to the practitioner himself, to know that nothing has been omitted from whence any advantage could be derived.

It will often indeed happen, that neither this, nor any other effort of art, will obviate the danger of the patient. But when the principles upon which an operation is founded are evidently just, and when, on mature deliberation, it appears, that a patient may be saved by it, and that he cannot escape by any other means, is is not the frequency of its success alone by which we are to be directed: the danger induced by the cause for which it is employed is the object to be kept in view; and every practitioner who acts solely for the good of his patient, will at all times employ such means as are best calculated for the removal of this danger, without paying attention to any other consideration. If it were the object of surgeons to operate only where certain success would ensue, many lives would be lost that otherwise are saved; and in that case the practice I thus wish to inculcate, of applying the trepan in injuries done to the brain, where

no external mark of direction exists, would no doubt be inadmissible: but as the safety of those intrusted to us ought to be our first and great object, and professional fame only a secondary consideration, whenever we are certain that death must ensue, if not prevented by the timely application of a proper remedy, although there may be no great certainty of this remedy proving successful, yet if it is the only means from whence there is a chance of safety, it ought undoubtedly to be employed. It is on this principle solely that I have advised the practice of perforating the skull in different places, when, in a compressed state of the brain, the part chiefly affected is not pointed out by some external mark of injury: and although the opinion I have thus ventured to give is not agreeable to general practice, yet as this practice has ancient custom only for its support, being in every other respect apparently ill founded, the advantages which may accrue from a different mode of treatment will only require, as there is reason to hope, to be thus fully pointed out, in order to procure it a favourable reception.

Having fully adverted already to the after treatment of cases in which the trepan has been applied for the removal of a depressed portion of the skull, it will not be necessary to enter upon the subject again; for whatever the cause may be for which the operation is practised, the cure of the remaining sore ought to be conducted in the same manner.

SECTION IV.

Of Concussion or Commotion of the Brain.

EVERY affection of the head attended with stupefaction, when it appears as the immediate consequence of external violence, and when no mark of

injury is discovered, is in general supposed to proceed from commotion or concussion of the brain ; by which is meant such a derangement of this organ as obstructs its natural and usual functions, without producing such obvious effects on it, as to render it capable of having its real nature ascertained by dissection.

Almost all the symptoms commonly produced by a compressed state of the brain, as enumerated in the last section, are in some instances met with from concussion : but those which most frequently arise from it are, stupefaction ; torpor to a greater or lesser degree ; a slow, soft pulse ; and a dilated state of the pupils, even on the eyes being exposed to light.

As it is not always easy, however, to determine from the symptoms, what particular affection of the head may have taken place, I shall endeavour to mark, as far as can be done, a distinction between concussion and inflammation, as well as between concussion and compression of the brain. It is an object of much importance, and therefore requires our most serious attention.

It is seldom difficult, as we have seen in the last section, to distinguish between the symptoms which proceed from inflammation, and those that arise from concussion. Such as proceed from concussion alone, commence immediately on the injury being done ; in violent degrees of them, the patient remains totally insensible : the pupils are much dilated, and do not contract even when the eyes are exposed to the strongest light ; and the pulse, although sometimes full, is not hard nor strong, and it always becomes weaker on blood being taken away.

Those symptoms again which originate from inflammation, seldom appear till several days after the accident : by the description to be more particularly given of them in the following section, it will appear, that they are materially different from those which proceed either from a compressed state of the brain or from concussion. The pupils are not dilated ; nay the eyes, excepting in the more advanced stages of

the disease, are very sensible to the impression of light ; and the pulse is firm and hard from the first, and does not become weaker on moderate evacuations of blood.

By these marks of distinction, as well as others, which an attentive practitioner will commonly notice, little uncertainty can prevail in determining whether symptoms proceed from concussion or inflammation ; so that with respect to this point we may soon determine on the practice to be pursued. And again, we can easily distinguish between symptoms arising from slight degrees of concussion, and those which proceed from compression. Thus, when a person is knocked down by a blow upon the head, and quickly recovers from the more alarming effects of it, but remains for a considerable time giddy ; with slight pains in different parts of his head ; with tinnitus aurium, weakness of sight ; some degree of imbecility, and loss of memory ; if no other symptoms occur, and especially if he is able to walk about, as frequently happens even in high degrees of these symptoms ; we conclude from experience in similar cases, that they all proceed from commotion or concussion, and not from compression of the brain ; for the symptoms which proceed from compression are of a more permanent nature, and uniformly continue till the cause which produced them is removed.

But where the symptoms are important from the beginning, and especially when the patient is altogether insensible, if no external mark of injury takes place, it is always difficult to determine whether they depend upon concussion or depression. Indeed instances often occur, in which symptoms supposed to originate from concussion, have after death been found to proceed from extravasation, or perhaps from a fracture attended with depression of the skull which had not been previously discovered. And again, symptoms have often been suspected to arise from extravasation, when on dissection, no vestige either of this or any other morbid appearance could be traced.

So far as my observation goes, the most material difference between the symptoms arising from these two causes, concussion and compression of the brain, is met with in the pulse and breathing. In a compressed state of the brain, the breathing is commonly deep and oppressed, similar to what takes place in apoplexy ; whereas, in patients labouring under the effects of concussion, the breathing is in general free and easy, and the patient lies as if he was in a sound and natural sleep. The pulse is commonly soft and equal, and not irregular and slow, as it usually is when the brain is compressed. In a compressed state of the brain, although little or perhaps no relief may be obtained from bloodletting, yet no harm is observed to ensue from it ; so that in moderate quantities, it does not reduce either the frequency or strength of the pulse : whereas in concussion of the brain, the pulse, as I have already remarked, will frequently sink, and become much more feeble on the loss of only eight or ten ounces of blood.

In doubtful cases, therefore, a quantity of blood should be immediately discharged : if the pulse, upon six or eight ounces being taken away, is found to be stronger and fuller than before ; if the blood is found to be fizy ; and especially if the patient becomes more sensible ; we may conclude with much probability, that the symptoms depend either upon extravasation ; upon some part of the skull being depressed ; or upon some degree of inflammation : and as long as the pulse remains firm, and any advantages are gained by it, we may with safety proceed to discharge more blood.

But when the pulse, upon a few ounces of blood being taken, becomes feeble, especially if the patient becomes weak and languid, as almost always is the case when the symptoms proceed from concussion, as the nature of the case is thus rendered in some measure certain, any farther discharge should be immediately prevented.

I have already endeavoured to shew, that concussion of the brain appears to operate by inducing debility of the whole system ; our remedies, therefore, instead of tending to increase this, as bloodletting very certainly does, should be such as give additional vigour.

With this intention, in similar circumstances arising from other causes, we would advise not only the internal use of cordials, but the outward application of stimulants ; and as symptoms of debility in the case we are now considering, are as strongly marked as in any disease whatever, I am clearly of opinion, that cordials, and even stimulants, are equally necessary in the method of cure.

Many practitioners have acknowledged, that although they have by general custom been induced to take blood freely in all injuries done to the head, that in various instances no benefit has been derived from it, and in some that it has even done harm. Having met with many instances of this, in which all evacuations of blood sunk the strength of the patient in an alarming manner ; and finding indeed, unless where the symptoms arose clearly from inflammation, that few, if any, recovered, when the practice of discharging much blood was carried far, I was induced in the first place to see what would result from no evacuation of blood being advised, and trusted chiefly to laxatives, and a gentle moisture being kept upon the skin. On finding that no bad effects ensued from it, and, even that more patients recovered than had commonly done from bloodletting, I was thereby induced to carry the practice farther.

Upon this principle, cordials were given internally : stimulants, particularly blisters, were applied externally, in the same manner as is usually done, in debility proceeding from any other cause ; and hitherto the effects that result from it have been such as sufficiently warrant a continuance of the practice.

In every case, therefore, where concussion of the brain appears to be the cause of the symptoms, the

practice I would recommend is, to exhibit in a gradual manner such quantities of warm wine as would appear to be proper for the same symptoms of debility induced by any other cause : as patients in such circumstances are apt to become cold, they should be kept warm by proper coverings : a blister should be applied over all that part of the head of which the skin has not been injured ; sinapisms should be applied to the feet ; and although strong purgatives would be improper, by tending to reduce the strength of the patient, yet gentle laxatives prove always useful, and should be regularly given, when the state of the bowels requires them.

As wine is a cordial upon which we can place more dependence than on any other with which we are acquainted, it ought in this, as in every case where cordials are required, to be preferred. But although with due pains, by opening the patient's mouth, and putting it in with a spoon, it may in almost every case be exhibited ; yet occasionally we meet with instances in which it cannot be swallowed in sufficient quantity : in this case the volatile alkali, ardent spirits, and other cordials of a more active kind, should be given.

In concussions of the brain, Mr. Bromesfield has recommended the use of opiates ; a circumstance which tends much to corroborate the opinion I have endeavoured to establish of the nature of this affection ; for few medicines act with more certainty as cordials than opium : when conjoined with antimonials, I have frequently found it prove useful ; but although I have upon such respectable authority employed opium by itself, I have not hitherto found it answer so well as wine. This, however, may proceed, either from my not having pushed the use of it so far as I ought to have done ; or from the few cases in which I have employed it having been such as would not have done well whatever remedy might have been used. I must, therefore, have farther experience of

its effects before venturing to speak of it with more decision.

Issues are commonly advised here ; but as more advantage I believe is to be derived from the stimulating powers of blisters, than from any discharge which they produce, instead of preserving a blistered part open, with issue ointment, as is usually done, I would prefer a repeated and frequent renewal of blisters on different parts of the head and neck. In this manner, any advantage to be derived from them as drains, will be equally certain as from issues ; and by applying one blister on another being nearly healed, almost a constant stimulus will be kept up.

In the progress of the cure, we sometimes derive advantage from a liberal use of bark and steel mineral waters. Gentle emetics have likewise proved useful ; and when much languor, inactivity, and loss of memory, have continued more permanent than usual, electricity has been employed with advantage.

It must, however, be remembered, that, in recommending this practice, it is expressly for the removal of symptoms that arise from concussion, and that do not depend either upon a compressed state of the brain or on inflammation ; a circumstance which may in general be so far ascertained as to render it obvious whether such a course is proper or not, merely by the effects that are observed to result from bloodletting. Attentive observation of other circumstances might in some instances enable us to decide upon this point, without the necessity of having recourse to this means of distinction ; but where there is such room for uncertainty as frequently prevails here, and where the life of a patient is to depend on the practice to be pursued, nothing ought to be omitted that can tend to establish an accurate knowledge of his situation. In such circumstances, therefore, there is no room to hesitate ; so that where much doubt and uncertainty take place, as much blood should be discharged as may tend to determine the nature of the case.

This is the practice I would always advise for the removal of symptoms arising solely from concussion : and accordingly, I have not thought it necessary to mention the use of the trepan ; for although it is very universally advised, yet unless where symptoms take place of a compressed state of the brain, no good reason can be assigned for it. But in cases of doubt and uncertainty, and especially where a patient remains comatose and insensible, the trepan ought by all means to be employed ; for as in these circumstances it could not add to the danger ; and as it affords the only chance of safety in symptoms arising from compression, practitioners would be highly blamable were they not to advise it ; and as the hazard of the patient must here be imminent, perforations should be made in every accessible part of the skull as long as the cause remains undiscovered.

We now proceed to consider more particularly the effects of inflammation upon the brain.

SECTION V.

Of Inflammation of the Membranes of the Brain from external Violence.

INFLAMMATION in every part of the body demands particular attention, more especially in organs of importance ; for its effects being in general violent and rapid, if not quickly removed they commonly end in more permanent distress : if this is the case in parts of less importance, it is more particularly so in inflammation of the membranes of the brain.

Inflammation of the brain and of its membranes is apt to produce all the symptoms that commonly occur in inflammatory affections of other parts, while at the same time it excites a set of symptoms in some degree peculiar to itself. By whatever cause inflamma-

tion of the brain or of its membranes may be induced, the symptoms do not appear immediately ; seldom indeed till several days after the injury, and often not till two, three, or more weeks, have elapsed ; a circumstance, I must again observe, that serves with more certainty than any other to distinguish inflammation of these parts from every other affection to which they are liable : for, while the symptoms of inflammation approach by slow degrees, the effects of concussion succeed instantly to the injury by which they are produced ; and this is also the case with those symptoms that proceed from a depressed portion of bone, or from extravasation of blood or serum.

At some uncertain interval, of two or three days, in some cases of as many weeks, and in a few instances of two or three months, from the date of the injury, the patient begins to feel an universal uneasiness over his head, attended with listlessness and some degree of pain in the part that was hurt, but of which perhaps he has not till now had any cause to complain.

The listlessness becomes more remarkable ; the patient appears dull and stupid, and the pain becomes more severe in the injured part ; while in other parts of the head a sensation of fulness takes place as if the brain was girded or compressed : the patient complains of giddiness, nausea and retching. He finds himself hot and uneasy ; his sleep is disturbed, and he is not refreshed either with what he enjoys naturally, or by what is procured with opiates. The pulse is firm, or rather hard and quick, as it almost always is indeed in inflammatory affections of membranous parts : the face is commonly flushed ; the eyes are from the beginning somewhat inflamed, and exposure to light creates a good deal of pain.

Where the symptoms are accompanied with a wound of any part of the head, this flushing of the face and inflammation of the eyes are apt to be attended with and seem to depend upon an erysipelatous affection

proceeding from the fore : in which case the edges of the wound first become hard and tumefied ; and the swelling, which appears to originate in the aponeurotic expansion of the muscles of the head, spreads quickly over the whole of it, especially towards the eyelids, which often become swelled to such a degree as to shut the eyes entirely. This swelling is somewhat soft, and receives with ease any pressure that is made on it : it is painful to the touch, and the skin over the whole of it has an erysipelatous degree of redness.

This diffused swelling, however, although formidable in appearance to those who are not versant in this branch of practice, does not in general prove so dangerous, as that puffy circumscribed tumor to which the parts that received the blow are more especially liable ; for this erysipelatous swelling, which extends over almost the whole head, proceeds most frequently not from any thing bad within the skull, but merely from the external wound in the tendons or muscles : in which case all the symptoms that take place, very commonly vanish by the effect of those means which usually answer best in erysipelas in other parts. In a few instances, however, this symptom appears to arise from an affection of the dura mater ; in which case its tendency is always of the most dangerous nature, and therefore requires our most serious attention.

Soon after these symptoms have taken place, the part which received the blow begins to assume some appearances of disease. If the bone has been laid bare, it is now observed to lose its natural healthy complexion : it becomes pale, white, and dry, either over its whole surface, or in particular spots which by degrees extend over the whole ; and the edges of the fore, from the first commencement of the symptoms, become hard, dry, swelled, and painful : but when the bone has not been denuded, and when none of the softer parts have been divided, but merely contus-

ed, they now begin to swell, become puffy, somewhat painful to the touch, and if the head is shaved, the skin is observed to be of a more deep red than in the rest of the head : if, in these circumstances, the swelled part is now laid open, the pericranium will in all probability be found detached from the skull : a small quantity of a thin, bloody, and somewhat fetid ichor will be found between this membrane and the bone ; and the bone itself will be discoloured in nearly the same manner as if it had been laid bare from the beginning.

With proper assistance, all these symptoms are for the most part soon carried off ; but when either neglected from the beginning, or when not quickly removed, they very constantly become worse. The pulse still continues quick and hard ; the patient becomes more and more restless ; and in some instances, delirium takes place. His skin is in general hot, but at times he is seized with shiverings, which gradually become not only more severe, but more frequent, and at last they are commonly succeeded by coma or stupor.

About this period all these symptoms either become so much milder as not to be distinctly observed, or they are altogether lost in those that ensue. Paralysis of one side is not unfrequent ; the pupils become dilated, and are scarcely affected by the impression of light ; the urine and fæces are passed involuntarily ; subfultus tendinum and other convulsive symptoms take place ; and, if the patient is not speedily relieved, death very quickly ensues.

These are the most frequent symptoms arising from inflammation of the membranes of the brain. Others are met with in particular instances ; but those that I have narrated are the most frequent, and they serve to mark the presence of the disease with sufficient precision.

In this enumeration, attentive observation will readily distinguish two sets of symptoms; each of which is connected with and clearly points out a particular state or stage of the disease. The one I would name the inflammatory state, and the other the suppurative or purulent state.

In the treatment of these symptoms, it is of much importance to attend to this distinction. It ought to serve indeed as the basis of our practice, in so far as the remedies to be used in the one stage of them are improper or even inadmissible in the other.

During the prevalence of inflammation, we rely chiefly on the effects of bloodletting; but we ought to abstain from it, when the disease has advanced to suppuration. In this state the operation of the trepan can alone give relief; while during the continuance of inflammation, it is not only useless, but might even do harm. I shall hereafter, however, have occasion to speak more particularly of this.

External violence may induce inflammation of the brain and its membranes in three different ways; by depressed portions of the skull irritating the dura mater; by contusion; and by simple fissures or fractures of the skull not attended with depression. The first of these we have already considered, and I shall now proceed to treat separately of the other two.

§ 1. *Of Contusion of the Head.*

It is not those slight contusions which affect the teguments of the head only that we are now to consider: it is such only as in their consequences prove formidable by communicating inflammation to the membranes of the brain that it is here necessary to mention.

A contusion of the head may be produced in the same manner with contusions of other parts; by falls, blows, and by stones or other missile weapons thrown from a distance. It may be attended with wounds of

the skin and other teguments ; or the skin, as most frequently happens, may be left entire.

The most frequent effect of those blows upon the head that afterwards end in danger, is instantly to deprive the person of his senses, who complains, on his beginning to recover from this, of some degree of giddiness, which continues for a longer or shorter period, according to the degree of violence which the brain has suffered. In a gradual manner, however, the patient recovers so as commonly to be nearly well after a night's sleep ; and unless a wound has been produced along with the contusion, he seldom or never complains of the part on which the injury fell, till several days after the accident.

The time that intervenes between a blow being given and the commencement of the after symptoms is very uncertain : these symptoms all originate from inflammation, and this again makes a slow or rapid progress according to the violence of the cause, and habit of body of the patient. Hence, in some cases, the inflammatory symptoms appear in the course of a day or two ; whilst, in others, the patient continues perfectly well for several weeks, and at last is seized with pain and inflammation of the part that was first hurt, and from which alone all the train of bad symptoms proceed that I have mentioned : nay, instances have occurred of cases of this kind ending fatally, in which no appearance of any thing morbid was observed on the part that received the blow, till the eightieth, ninetieth, or even till the hundredth day from the accident.

Hence, it is evident, that much danger may arise from injuries done to the head, which do not at first exhibit any suspicious appearance : a circumstance that points out the propriety of paying the most accurate attention to every violence which it receives.

In the treatment of contusions of the head, the indications to be kept in view are,

1. To employ the most effectual means for preventing inflammation.

2. When these do not succeed, we should endeavour to keep the symptoms moderate, and to prevent the formation of matter.

3. When this proves to be impracticable, and when suppuration takes place, a free vent should be procured for the matter : and,

4. When the injured parts are attacked with gangrene, the most effectual means should be immediately employed for putting a stop to it.

With respect to the first indication, I may remark, that in slight contusions of the head we seldom have it in our power to employ any prophylactic or preventative means. Patients commonly recover speedily from the immediate effects of contusions, and, till the after symptoms commence, they seldom complain of any thing but a slight soreness in the injured spot. Practitioners are not often informed therefore of the accident till it is too late ; and when they are, the patient will seldom submit to any course that might prove useful. But when this can be done, the means we should advise are, bloodletting, both general and local, to a considerable extent ; the use of laxatives, to preserve an open state of the bowels ; the application of a strong solution of cerussa acetata to the part affected ; a low diet, and total abstinence from every kind of fatigue.

Saturnine and other cold applications are sometimes employed with advantage even where the brain and its membranes appear to be hurt, but they prove chiefly useful, where the injury is confined to the external parts of the head.

By these remedies, the effects of many injuries done to the head might be prevented : but practitioners, as I have remarked above, are seldom called till the bad symptoms have commenced ; the particular treatment of which we are now to consider.

In every instance, we should endeavour, as quickly as possible, to carry off the inflammation; the most effectual remedies for which are, bloodletting, purgatives, mild sudorifics, and opiates, along with local applications to the injured part.

In common practice, the blood is, in such circumstances, taken indiscriminately from any part of the body: but by many of our older writers, and even by some of the moderns, we are told, that blood taken from the feet proves more effectual than the same quantity taken from any other part.

This, however, is an idea built upon the erroneous doctrine of derivation and revulsion, which is now very generally exploded. Instead of which, we find, that in every case of inflammation, any blood that we discharge proves most useful when taken from the injured spot. We particularly observe, in injuries done to the head, that much advantage ensues from the blood that is discharged from vessels divided in the operation of scalping, or that of laying the skull bare; a circumstance which strongly indicates the propriety of local bloodletting in all affections of this kind.

On this principle, when a sufficient quantity of blood can be got by the application of leeches, or by cupping and scarifying near to the injured part, this mode of discharging it should be preferred: but when this cannot be done, we may always succeed by scarifying the parts with a lancet or scalpel; a practice from which I have in different instances derived much advantage, and which I therefore wish, in the strongest manner, to recommend. When the skull is already laid bare by the injury, or when the scalp has been divided in order to discharge any matter collected beneath, there can be no necessity for these scarifications; but when the teguments remain entire, or are only slightly hurt, and are attacked in a particular part with inflammation, scarcely any remedy answers so well as scarifications, which, in order to prove useful, ought to be freely carried into the parts beneath,

with a view to divide the largest arteries that can be reached. In this manner, any necessary quantity of blood may be taken, and it proves always more certainly useful than any other mode of discharging it.

When this operation however is not agreed to by the patient, or when general bloodletting may be judged more advisable, it answers best to open the jugular vein or temporal artery. With respect to the quantity of blood to be discharged, this must always depend on the violence of the symptoms and strength of the patient: but in circumstances such as we are considering, as the patient's recovery or death is probably to depend on what is done in a very short space of time, bloodletting, as being the remedy on which our hopes ought chiefly to be founded, should be pushed immediately to as great a length as with safety can be done. Instead of taking eight or ten ounces, and repeating the operation, as is usually done, I always think it right, as I have just observed, to be determined by the strength of the patient, and to draw blood as long as the pulse continues firm. While this continues to be the case, no danger occurs from the evacuation; and in all cases of violent inflammation, it answers the purpose with most certainty, to take twenty or twenty-five ounces of blood at once, than to abstract even a larger quantity by repeated operations. In the course of a few hours, again, if the symptoms still continue severe, and if the pulse remains sufficiently full, it may be proper to discharge an additional quantity; but this likewise should be determined by the effects that result from it.

Together with a plentiful evacuation of blood, the bowels should be freely emptied, by brisk purgatives when these can be exhibited; or when they cannot be taken in sufficient quantities, stimulating glysters should be given instead of them. In all affections of the head, it is an object of importance to preserve an open state of the bowels, particularly where inflammation has attacked the brain: it is not, however, an

open state of the bowels merely that proves useful. In order to receive much benefit from the practice, a smart purging should be kept up, with repeated doses of calomel, jalap, fenna, or some of the neutral salts.

As it is found in every case of inflammation, that advantage is derived from the skin being kept soft, it ought always to be advised in an inflamed state of the brain. Perspiration may, for the most part, be induced by warm fomentations applied to the feet and legs, and laying the patient in blankets instead of linen; but when means of this more simple kind do not answer the purpose, more powerful sudorifics must be employed.

In a great proportion of cases, the common effervescing draughts answer sufficiently well, particularly when a few drops of antimonial wine are added to each dose: the calx antimonii nitrata, which appears to be the same with Dr. James's celebrated powders, is sometimes used with advantage; but nothing acts with such certainty as a combination of opium and antimony, or opium and ipecacuanha, as we have it in the form of Dover's powder.

This last is recommended by a late celebrated practitioner of London, Mr. Bromfield;* and I know from frequent experience, that the other proves often highly beneficial, and that it acts with entire safety.

In severe degrees of pain, large doses of opium become necessary. A general prejudice has till of late indeed prevailed against the use of opiates in all cases of inflammation, particularly in inflammation of the brain; but this seems to have arisen more from an erroneous idea of the proximate cause of inflammation, and of the *modus operandi* of opiates, than from actual observation of the effects which they produce. By exciting some degree of heat, and in some instances increasing the fulness of pulse, it has been supposed

* Vide *Chirurgical Observations and Cases*, by William Bromfield, p. 12, vol. i.

ed that they must always do harm in inflammation ; but I can from much experience of their effects assert, that these fears are groundless, and even in inflammation of the brain, that very important advantages often result from them. By lessening the pain, and removing that restless state of anxiety that commonly prevails, they frequently prove more useful than any other remedy.

These are the means on which we chiefly rely ; but some attention is likewise necessary to the local treatment of the injured parts, from which more advantage I think may be derived than is commonly imagined.

Instances often occur of inflammation in other parts of the body being relieved by drains or issues ; and on the same principle I have long been in the habit of advising drains in inflammatory affections of the head.

With a view to this, when the teguments are divided, whatever the extent of the cut may be, as the lips of the fore are apt to become hard, dry, and painful, those applications should be advised which answer best in promoting the formation of matter : the fore should be covered with pledgets of lint spread with any emollient ointment, and warm emollient poultices should be laid over the whole. In this manner, and particularly by a frequent renewal of poultices, a plentiful discharge of matter is commonly induced ; which soon lessens the pain, and removes the hardness of the injured parts, by which all the other symptoms soon become moderate.

Where again the teguments are not divided, as soon as there is cause to suspect, from the parts that were injured becoming pained and swelled at the distance of several days perhaps from the accident, that bad symptoms may supervene, the tumor should be immediately laid open, by dividing the skin and teguments down to the pericranium ; and if that membrane is found to be separated and raised from the bone, it ought also to be laid open : by this means any mat-

ter that is confined, and which otherwise might have done harm, will be discharged ; and by inducing a suppuration upon the fore, in the manner I have mentioned, all the symptoms will be kept moderate.

In the treatment of these tumors, they are seldom opened till a fluctuation is distinctly perceived in them. In this, however, I think we are wrong ; for the matter that tumors of this kind contains is constantly thin and acrid ; so that to confine it in contact with the skull, must not only render the bone liable to become carious, but must even incur some hazard of making the inflammation spread to the membranes of the brain : for, as an intimate connection takes place between the vessels of the pericranium and dura mater ; and as it is evident in this kind of injury, where the external parts are first hurt, that the dura mater becomes inflamed only in consequence of its connection with these, I have long thought it probable, that the confinement of acrid matter beneath the pericranium, is to be considered as the most frequent cause of the inflammation being communicated to the parts within the skull : I have accordingly been in the habit of discharging it by a free incision, as soon as the least tumefaction on the part affected is perceived ; and evidently with much advantage.

In all injuries indeed done to the head, in which the symptoms do not commence till several days after the accident, as the inflammation does not originally attack either the brain or its membranes, for if it did so, its effects would be immediate, it is probable that it acts almost solely by producing an effusion between the pericranium and skull : and as we know that membranous parts seldom or never afford good pus, any effusion which takes place must commonly be of a nature that will not readily become purulent, and will therefore be apt to acquire that kind of acrimony commonly met with in every extravasated fluid that cannot be converted into pus.

Where the effusion is considerable, an evident tumefaction takes place from the beginning : but it often happens, that it is so small in quantity as scarcely to produce any perceptible swelling at first ; in which case, as there is little or no tension, the patient feels little uneasiness till the effused fluid begins to turn acrid, which may happen sooner or later according to the violence of the injury, and habit of body of the patient, as well as other circumstances. But as soon as it becomes acrid, it excites pain, inflammation, and swelling ; and as the pericranium and aponeurotic expansions of the muscles are very firm and strong, if this acrid matter be not soon discharged by an incision, it gradually insinuates between those parts of the pericranium and bone beneath that were not at first affected : and as this extends the effects of the injury, it not only tends to increase the tumor of the integuments, but, by means of the vascular connection that I have mentioned between the pericranium and dura mater, the inflammation is at last conveyed to the parts within the skull ; and as soon as these inflame, but never till then, the bad symptoms are sure to take place.

It is therefore probable that the confinement of this acrid matter beneath the pericranium, must have no small effect in promoting the progress of the inflammation ; and hence, to discharge it by an incision is always advisable whenever there is cause to suspect, from the accession of pain and some degree of tumefaction as the consequences of external violence, that matter is collected even in the smallest quantity between this membrane and the skull.

It must be remarked, however, that I do not wish to recommend this practice in the treatment of tumors recently produced by external violence. It often happens, that a tumor of a considerable size succeeds instantly to a blow on any part of the head ; but in general this soon disappears on the application of mild astringents, such as solutions of crude sal am-

moniac, white vitriol, or saccharum saturni: ardent spirits make also a good application for these tumors, and they seldom fail to remove them.

It would therefore be improper in all such cases to lay the injured parts open; a practice, however, often adopted by those who are not versant in this branch of business; for, as this kind of tumor frequently affords, to manual examination, a sensation similar to what is experienced from a depression of the skull, young practitioners are very apt to be deceived with it, and to advise the skull to be immediately laid bare. But no practitioner of experience will ever be deceived with these appearances; nor will he ever proceed to lay the skull bare, if more evident marks do not take place of its being injured, or of matter being extravasated beneath the skull itself. But whenever a tumor attended with pain, appears at a distant period upon the spot on which a blow or a bruise was received, as it seldom or never happens that swellings of this kind are of a harmless nature, or that they can be dissolved by external applications, they should in every instance be laid open as soon as they become perceptible. By doing so, we can never do harm; while we always derive advantage from discharging acrid matter, which in circumstances such as we are considering, is almost always collected beneath the pericranium.

An incision made for discharging matter, must necessarily go to the depth at which the matter is seated; otherwise the purpose for which it is meant will not be answered: and as in the circumstances now under consideration, it is almost in every instance collected beneath the pericranium, this membrane should always be freely divided. But in making scarifications in the manner I have advised above, for the purpose of discharging blood, as they are supposed to be necessary before any tumor has appeared, and not intended for the evacuation of matter, they need never be carried to such a depth. They should pass indeed freely into

the cellular membrane, otherwise the arteries of the part will not be sufficiently divided ; but as no advantage could be derived in this state of the disease from dividing the pericranium, and as the bone might be hurt by it, it ought never to be advised.

The wound produced by the incision, should be dressed with any emollient ointment ; and by the frequent renewal of warm poultices over the whole, a plentiful suppuration will be induced, which, as I have already remarked, proves commonly very effectual, not only for preventing, but removing all those bad symptoms which inflammation of these parts is sure to induce.

When, however, the inflammatory state of the brain does not yield to this treatment ; when the symptoms become more violent, and are succeeded by paralysis, irregular convulsive motions, involuntary passage of the fæces and urine, dilatation of the pupils, and insensibility to the impression of light, along with a slow and full pulse ; and more especially when these symptoms have been preceded by fits of rigor or shivering ; we conclude, that the suppurative state of the disease has taken place ; that matter is formed within the skull, and operates by compressing the brain. Shivering fits take place on the formation of large abscesses wherever they are seated ; but in inflammatory affections of the brain, they prove so certainly characteristic of suppuration, that no doubt can remain of matter having formed, whenever they are found to accompany the other symptoms that I have mentioned.

The existence of matter within the cranium being ascertained, as we cannot depend on any other means for carrying it off, the trepan should be immediately advised ; and as the safety of the patient is to rest entirely on a free discharge being given to the matter, it should be applied with much freedom. In such circumstances, indeed, it would be very culpable timidity in any practitioner to hesitate in forming as many perforations as are necessary for discharging the matter.

When, on perforating the skull, no matter is met with, if the dura mater appears to be more tense than usual, as this will give cause to suspect that the symptoms of suppuration have arisen from matter collected between this membrane and the pia mater, or perhaps upon the brain itself, we ought not to rest satisfied with having merely perforated the bone: if in such circumstances we proceed no further, the matter will still remain confined; the brain will be nearly as much compressed as before; and of course no advantage will be derived from the operation.

In this situation, therefore, a practitioner should not hesitate in dividing the membranes of the brain. But, for the method of effecting this, as well as for some further observations which relate to it, I must refer to the second section of this chapter, where the subject has been fully considered.

When, again, it is found on perforating the skull, that the dura mater has become sloughy, with some tendency to gangrene, the utmost danger is to be dreaded: if mortification has commenced, death will soon probably terminate the scene, although instances have occasionally occurred of sloughs forming upon the dura mater, and of cures being accomplished after these have separated: all, however, that art should in such cases attempt, is to preserve the sores clean; to see that any matter which may form shall be freely discharged; to take care that nothing but light easy dressings shall be employed; and that Peruvian bark, conjoined with elixir of vitriol, shall be immediately given in as great quantities as the stomach will bear. If any tendency to inflammation still prevails, the diet should be low, with a plentiful allowance of whey and other diluents, and regular stools should be procured: but, when the system is low and the pulse feeble, wine should be exhibited as the most effectual cordial. In other respects, the treatment should be such as proves most beneficial in similar affections of other parts of the body; but as this has already been fully taken

notice of in a preceding chapter, it is not necessary to enter upon it again.*

Before leaving the subject that we are now considering, I think it right to notice a practice that has prevailed in the treatment of this kind of injury, which ought in my opinion to be laid aside ; namely, the indiscriminate use of the trepan in the inflammatory as well as in the purulent or suppurative stage of these symptoms. It has been common, in all cases of this kind, in the first place to prescribe large evacuations ; and if these do not procure relief, to apply the trepan immediately, whatever may be the stage of the disease.

This practice is chiefly founded on an idea that has prevailed with some, of the operation of the trepan being an innocent remedy, and of no harm being ever produced by it. In support of this opinion, experiments are related of the operation having been performed in sound animals, with a view to determine the question, whether exposure of the brain to the air is detrimental or not ? And as it has happened in several instances, that no bad effects have ensued, a general conclusion has been drawn in favour of the operation.

But were we for a moment disposed to admit the truth of this conclusion, yet one great objection to the application of the trepan in an inflamed state of the brain, would occur, that no benefit could be derived from it. The sole object we should ever have in view from this operation, is to remove pressure from the brain : but in an inflamed state of this organ, as no pressure is supposed to exist, the remedy is of course unnecessary.

If practitioners would allow themselves to be directed by the effects of those remedies that prove useful in similar affections of other parts of the body, inflammation of the brain would never be treated in this manner : we need not surely expect to derive advan-

* Vide Treatise on Ulcers.

tage from perforating the chest in the first stage of an inflammatory affection of the pleura; nor would any surgeon advise it till the formation of matter was fully indicated.

Besides this, however, I am decidedly of opinion, that the trepan cannot be applied in inflammation of the brain, but with manifest hazard: it tends always to increase the symptoms of inflammation; and in almost every instance in which I have known it employed during this state of the disease, the dura mater has been found, after death, either in a state of mortification, or covered with purulent matter. These effects we may suppose to be in some measure the consequence of admission of air to the brain; and they may be partly owing to the violent separation of a portion of the cranium from the inflamed dura mater, to which it adheres firmly in almost every point.

Neither is this the only ground on which I would object to the practice: contrary to the received opinion, I think that the operation of the trepan is in itself dangerous even when performed in a sound state of the brain, where no inflammation takes place. Several years ago I made a variety of trials to determine this point; and nearly one fourth of the animals that underwent the operation, appeared to die from the effects of it.

It is not, however, from the effects of this operation on other animals alone, that I wish to draw any conclusion; but when consequences similar to what I have stated, result from it when performed on the human body, when no immediate injury has been done to the head, they will be allowed to have much weight in establishing the opinion I have advanced. I have accidentally met with three cases much in point, in none of which there was any appearance of inflammation of the brain previous to the operation; and yet, two of the patients died in a few days after the perforation of the skull, evidently from inflammation induced upon the dura mater. As cases of this kind

do not often occur, and as the result of these tends to establish the validity of the opinion I have advanced, I shall here give a short account of them.

In cases of inveterate epilepsy, where every other means of relief have failed, it has been proposed, to admit the free pressure of the atmosphere to the surface of the brain, by one or more perforations made in the skull with the trepan. Any advantage to be obtained from this, I must acknowledge to be extremely doubtful; and the effects of it appear to me to be so uncertain, and even hazardous, that I should never think of advising it. But it has so happened, that I have known two instances of its being done by others; and in a third, I had occasion to put it in practice myself, in the case of a gentleman who had laboured under epilepsy for upwards of twenty years. But in this case, as the fits appeared to be the consequence of an injury received in childhood upon the forehead; as the external appearance of the part on which the injury was inflicted, gave cause to suspect that a small portion of the skull was depressed at this place; as there was some reason, therefore, to suppose, that the fits depended upon this cause, and as they were at this time become extremely violent, it was the opinion of several practitioners of this place, as well as the earnest desire of the patient, that the trepan should be employed. This was accordingly done; the portion of the skull which received the blow was taken out; and matters went on very favourably till the end of the second day from the operation, when symptoms of inflammation occurred; and, notwithstanding all the remedies that were employed, he died in little more than forty-eight hours from this period. On opening the head, a great quantity of pus was found, not only on the dura mater, but on the pia mater, and even between this membrane and the brain; and as there was not, till within twenty-four hours of his death, any symptoms of a compressed brain, there is much reason to think that the matter was formed

merely in consequence of inflammation induced by the operation ; and therefore, that the means employed for the patient's relief had evidently hastened his death.

One of the others on whom the operation was performed, recovered from the immediate effects of it, but with no alteration or abatement of the fits for which it was employed. The other died on the seventh day from the operation : symptoms of inflammation appeared on the third ; and these were at last succeeded by evident marks of a compressed brain : a considerable quantity of matter was found between the dura and pia mater, and even beneath this membrane, not merely on the parts contiguous to the wound, but over the whole surface of the brain.

We have here two cases, very distinctly marked, of the hurtful effects of this operation, even in a sound state of the brain, at least where no previous inflammation appeared to exist in it. The symptoms of inflammation which supervened in both instances, were evidently the effect of the perforations : suppuration ensued in both ; and as both the patients died in the space of a few days from this period, no doubt can be entertained of the cause of it.

I am therefore induced to consider the operation of the trepan as inexpedient, and even dangerous, in an inflamed state of the brain : but when suppuration has taken place, and when matter formed within the skull operates as a cause of compression, as this operation affords the only chance of safety, it should be employed with freedom, and without hesitation.

We proceed now to the consideration of fissures, or simple fractures of the skull.

§ 2. *Of Fissures or simple Fractures of the Skull.*

THE term fissure is here meant to imply a mere division or simple fracture of the skull not attended with

depression ; and it may either penetrate the whole thickness of the bone, or be confined to one lamella of it only : a fissure may also be attended with a division or wound of the corresponding teguments, or these may be left entire.

I have already had occasion to remark, that injuries done to the head, prove hazardous nearly in proportion to the violence which the brain receives from them : so that fissures, in so far as they affect the skull only, are not to be considered as dangerous ; but being frequently combined with affections of the brain from the beginning, and on other occasions productive of consequences from which this organ is ultimately brought to suffer, they of course require our most serious attention. It often indeed happens, that very extensive fissures heal without any bad symptom taking place ; but as others which are apparently trivial, frequently terminate in the most fatal manner, we cannot with propriety in any instance treat them with neglect.

Fissures of the skull may prove dangerous, either from being productive of effusions of blood or serum upon the brain, or by tending to excite inflammation of the dura and pia mater.

When effusions take place, as this must be attended with symptoms of compression, those means should be advised that are known to be best suited for its removal ; but as these have been already fully treated of in the preceding sections, it is not necessary to enter into a further detail of them : I shall just shortly observe, that for the removal of these effusions, we have to trust entirely to a proper application of the trepan. The fissures should be traced through their whole extent ; and a perforation being made in the most depending part of each of them, if this does not prove sufficient, the operation should be repeated along the course of the fractures, as long as any symptoms continue of a compressed state of the brain ; care being always taken to include the fissure in every perfo-

ration : for, as the cause of the mischief will in general be found contiguous to the fracture, it would seldom answer any good purpose to perforate the skull in any other part.

It is therefore scarcely necessary to observe, that care should be taken to trace the course of the fissures with much accuracy ; for which purpose, as soon as we resolve on performing the operation, if the whole extent of the fracture has not been previously discovered, it should now be done by making an incision through the skin and other teguments down to the pericranium : and by taking care to follow the direction of the fissures, they may thus be brought freely in view.

When fissures are of such magnitude as to produce an obvious separation of the two sides of a fractured bone, the nature of the case at once becomes obvious ; but it often happens, that they are so small as to render the operator doubtful and uncertain. A little attention, however, to the real state of the patient, will at all times prevent any hesitation respecting the means that we should employ.

The only appearances with which a fissure is in danger of being confounded, are, those indentations formed on the external surface of some parts of the skull by the blood vessels which run upon it ; and the different futures which serve to unite the bones of the skull together.

In doubtful cases of fissure, we may frequently be determined by the degree of adhesion that takes place between the pericranium and skull. The pericranium, as we have seen, naturally adheres firmly to every part of the skull, and particularly at the futures ; and as one certain effect of a fissure is to destroy this connection entirely, when the pericranium adheres to the bone beneath, we may conclude without hesitation, that no fissure exists ; and, on the contrary, when this membrane is loose and somewhat separated

from the bone, there will be much reason to suppose that any rent or crack that appears in it, is produced by a fracture.

It often happens, however, that we are deprived of this means of detecting fissures, by the pericranium and other teguments being separated from the bone for a considerable space. In this situation, various means have been proposed for obtaining a certainty of the nature of the case. By pouring ink over the surface of the denuded bone, the whole of it we are told, may be wiped off, if the bone is not fractured ; but, wherever there is a crack or fissure, that it will be impossible even with the assistance of water to remove it.

By making the patient keep a firm hold with his teeth of one end of a hair, or of a piece of catgut, while the other extremity is secured at such a distance as to render it tense, if it is now struck, the vibrations thus produced will create, we are told, a very sensible degree of uneasiness in the part affected, if it is fractured ; but will not otherwise have any effect. And again it is said, if the patient is made to chew a bit of bread, or any other hard substance, that some pain will occur from it if the bone is fractured ; but otherwise, that the injured part will not suffer.

None of these tests, however, are to be much depended on : neither of the two last have any effect, unless the fissure is extensive, and the sides of the fractured bone considerably separated from each other, when this means of distinction can never be necessary ; and as ink penetrates the sutures of the skull, unless when they are firmly ossified, it can seldom happen that any trial to be made with it will be productive of any advantage.

It commonly happens, in fissures extending through the whole substance of the skull, and even in such as penetrate only to the diploë, that blood continues to ooze from them for a long time after the accident, and it constantly returns again almost as soon as it is wiped off : this is one of the most characteristic marks

of a fissure, and it points out with precision the nature of the case. But there is no necessity, I may remark, for so much anxiety on this point as practitioners commonly express; for, unless when symptoms of an alarming nature take place, I shall presently endeavour to show that no operation should be advised: and again, whenever the symptoms indicate a compressed state of the brain, if any appearances of a fissure are dreaded in that part of the skull which has recently received a blow; however equivocal they may be, yet as this is most probably the seat of the injury, no doubt should be entertained of the propriety of perforating the skull at this place. If it should afterwards appear that the trepan has been applied upon a future, as the surgeon under such uncertainty would proceed with much caution, no harm could ensue from it; and if it should prove to be a fracture, it would afford him much satisfaction to find that the perforation had been made where alone it could prove useful.

But although I have in this place, as well as in other parts of these observations, advised the trepan as the only remedy to be trusted for the removal of symptoms of a compressed brain; yet unless where symptoms of this kind take place, even the presence of a fissure ought not to indicate the operation: but as this is a point upon which I happen to differ from many of the profession; and as it is of much practical importance to have it duly considered; I shall advert to it with more minuteness, than might be otherwise necessary.

Hitherto it has been a general rule, to consider the application of the trepan as necessary in every fissure, whether any symptoms of a compressed brain have occurred or not. But due attention to the real nature of a fissure, and to the effects most likely to result from perforating the skull, will show, that although fissures may be frequently combined with such symptoms as require the trepan, yet that they are not always or necessarily so; and unless when such symp-

toms actually exist, that this operation, instead of affording relief, must frequently do harm : for it is by no means calculated for, or in any respect adequate to, the prevention of these symptoms : and I have already endeavoured to show, that laying the brain bare is never to be considered as harmless ; and therefore that it should never be advised but when it is probable that some advantage may be derived from it.

When a fissure is attended with a compressed state of the brain, there can be no hesitation, as I have observed already, in recommending an immediate application of the trepan : but in the case of a fissure not accompanied with any symptom of this kind, and while the patient complains of nothing but perhaps a slight degree of pain in the contused part, an occurrence by no means unfrequent ; what advantages are we to expect from perforating the skull ? In this situation, we know, that no extravasation takes place ; and that no part of the skull is depressed, otherwise symptoms would occur of a compressed state of the brain : for what purpose, therefore, should the trepan be applied ? No sufficient reason, I believe, can be adduced for it.

In the case of a simple fissure, not attended with any bad symptoms, the most alarming occurrence that we have to dread is the accession of inflammation ; for it frequently happens, that the membranes of the brain become afterwards inflamed, although the patient may have remained perfectly well for several days, nay, even for weeks, after the injury producing the fracture was inflicted. Now, whoever attends to one of the immediate effects of the trepan, namely, the violence done by it to the dura mater, together with the admission of air to the parts within the skull, must acknowledge, that this tendency to inflammation, the circumstance which, of all others, we have most cause to dread, instead of being lessened by this operation, must, in all probability, be increased ; so that, as a preventative of bad symptoms, it ought never to be

advised. It has, indeed, been keenly held forth by those who support a contrary opinion, that, in fissures of the skull, no additional risk can be incurred by this operation ; for it is said, that air being already admitted to the brain by the fracture itself, the trepan will not give it a more free access, while at the same time, they observe, that it is attended with the very important advantage of forming and preserving a free vent for any matter that may form between the skull and dura mater during the cure.

This argument is specious, but it will not on examination be found to merit attention. For, when fissures are so extensive as to produce any obvious separation between the sides of the fractured bone, a more sufficient vent is thus procured for any matter that may form than could possibly be obtained by an operation : and again, in fissures of lesser extent, as they do not always terminate in the formation of matter beneath the skull, but, on the contrary, as they frequently do well without the occurrence of any bad symptom, it cannot surely be considered as prudent to advise a hazardous operation, merely for the chance of its becoming necessary. And besides, instances are often met with, in which fissures penetrate no deeper than the external table of the skull ; a circumstance which cannot be previously known ; and for which even the warmest supporters of the practice in question would never surely recommend a perforation through the whole substance of the bone.

The idea that has hitherto very universally prevailed, of the harmless nature of this operation, has probably been the chief cause of the opinion respecting the propriety of performing it in every case of fissure : but, if the opinion that I have given is well founded, any utility probably to be derived from it, will be more than counterbalanced by the hazard with which we suppose it to be at all times attended.

Whilst no bad symptoms supervene, a fissure of the skull should be treated, merely as a cause that may

give rise to inflammation. The patient should lose blood once and again, in proportion to his strength ; his bowels should be kept open ; the fore should be treated with mild dressings ; and as long as there is cause to suspect that inflammation may occur, violent exertion of every kind should be avoided : for although, in such circumstances, I would not, for the reasons that I have given, advise the common practice of perforating the skull in every case of fissure, I am perfectly decided in this, that fissures should always be treated with attention, and should have the most effectual means employed for obviating those effects that arise from them when inflammation takes place.

By the means that I have pointed out, a cure will frequently be obtained, without putting the patient to the hazard arising from the operation of the trepan ; but when, from the violence of the injury, or from any other cause, they are found to fail, and that the inflammation terminates in suppuration, as in such circumstances nothing but a free discharge to the matter can save the patient, this operation will now with much propriety be employed : but, for the reasons I have already advanced, I must again say, that till this stage of the disease takes place, the perforation of the skull ought never to be advised. The arguments adduced in support of this opinion in different parts of this and the preceding sections are perhaps of themselves satisfactory ; but in a point of such importance, no person should speak decisively on any opinion not supported by experience. When the result of experience, however, is supported by probability, we more readily give our assent to it than could ever be done to a mere practical fact ; and as all the observation I have been able to make respecting the point we are speaking of, tends to support the practice that I have advised, it is without hesitation that I venture to propose it.

SECTION VI.

Conclusion.

THE importance of the subject that we have just been considering, together with the intricacy in which it is involved, has led to a length of discussion which I did not at first expect : if, however, in treating of injuries done to the head, I have in any degree contributed to remove the perplexity that has hitherto obscured the subject, arising, as well from the complicated nature of the injuries themselves, as from the manner in which authors have generally handled them ; the time I have spent, and the pains I have taken, will not be thought misapplied.

The length to which this chapter has extended, points out the propriety of bringing the more material parts of the subject into one point of view : on this account, the following recapitulation is subjoined :

1. It appears, that in a state of health, the cavity formed by the bones of the skull is completely filled with the brain and its membranes.

2. That a direct communication takes place between the external coverings of the skull and the parts contained within it, by means of blood vessels passing between the dura mater and the pericranium, especially at the different sutures.

3. From this mechanism, we may perceive, how the smallest diminution of the cavity of the skull, however it is produced, must always occasion compression of the brain : and from it also we account for the ready communication of inflammation from the external teguments of the skull to the dura mater.

4. The various symptoms arising from injuries done to the head, may be referred to three general effects ; compression, concussion, and inflammation of the brain.

5. In a compressed state of the brain, the safety of the patient depends solely upon the removal of the cause by which the compression is produced. When a portion of the bone is beat in, and is at the same time so loose as to admit of its being taken out with the fingers of the operator, with common forceps, or perhaps a levator, these only should be employed : but when the depressed portion of bone is firmly fixed, or when the compression is produced by the effusion of blood, or formation of pus, a proper application of the trepan can alone afford relief ; and we ought not to hesitate in employing it.

In such circumstances, the patient is in a very hazardous situation ; and perforating the skull with the trepan as frequently as may be necessary, may prove, as it often has done, a very effectual remedy.

6. We are by no means, however, to imagine, as many have done, that a surgeon has accomplished all that may be proper for him to perform, on the operation being finished. Indeed, little advantage will in general be derived from it, if other circumstances are not kept in view. As the cause producing the compression, whatever it may be, must injure the membranes of the brain, care should be taken, as far as it can be done, to obviate the effects of it. No dossils, or syndons as they are termed, should be crammed into the perforations made by the trepan, and every irritating application should be avoided. The whole surface of the fore should be lightly covered with soft lint spread with any emollient ointment ; and this, with a compress of soft linen, should be retained by a common night cap, as the easiest and best bandage that can be applied to the head. The patient should lose blood in proportion to his strength ; his bowels should be kept open ; his skin should be preserved soft and perspirable ; a low diet should be recommended ; and he should be kept free from noise and every kind of disturbance.

7. When symptoms arising from external violence done to the head, depend on concussion or commotion of the brain ; as this seems to operate chiefly by inducing debility of the whole system, the common practice of discharging much blood, and giving strong purgatives, should be avoided.

Instead of this, a moderate use of wine, as well as other cordials, should be advised, together with a nourishing diet ; whilst blisters and other stimulants should be applied to the head itself. In long continued affections proceeding from this cause, such as loss of memory and imbecility, electricity may be safely employed. I have known some instances where it appeared to prove useful.

8. In the treatment of injuries done to the head, it should always be kept in view, that inflammation of the membranes of the brain very seldom takes place immediately, but is apt to supervene at some distant period from the injury being received : in consequence of which, accidents which do not at first appear to be of much importance, frequently terminate fatally at last.

Where inflammation has taken place, we depend chiefly on general and local bloodletting, carried as far as the strength of the patient will permit. Strong purgatives should be advised : sudorifics prove sometimes serviceable ; and when the patient is restless, and distressed with violent pain, opiates frequently prove useful.

When an inflamed state of the brain succeeds to a contused wound of the external teguments, warm emollient poultices are the best applications we can make to the sore. By inducing a discharge of matter from the neighbourhood of the inflamed parts, they prove often highly serviceable ; and, when the skin has not been divided by the contusion, it should be laid open upon the first appearance of a tumor, without expecting or waiting for a complete suppuration.

In recommending this treatment, I have departed from the common mode of practice, which directs the immediate application of the trepan if bloodletting and other evacuations do not afford speedy relief; and I have done so for two reasons.

In the real inflammatory state of the membranes of the brain, compression of that organ does not take place: it is not indicated by the symptoms which take place, nor is it met with on dissection in such patients as die in this stage of the disease: perforating the skull therefore in this situation can do no good. And farther, the operation of the trepan in itself, is not, as is generally imagined, innocent and harmless. By admitting a free access of air to the membranes of the brain, it tends evidently to excite and promote inflammation in the parts beneath. Applied therefore in this case, the trepan may aggravate, but cannot relieve, the complaint for which it is used.

9. When, notwithstanding all our endeavours, the formation of pus takes place, either upon the surface of the dura mater, or within this membrane, it falls in every respect to be treated as effusion induced in any other way. In this situation, the operation of the trepan is indispensably necessary; for by no other means can the matter be discharged, or the safety of the patient insured.

In performing this operation, instead of removing a considerable portion of the skin and other teguments, as has commonly been done, a simple incision upon the part in which the instrument is to be applied is all that is necessary; and no more of the pericranium should be removed than is required for this purpose.

10. During the progress of the cure, after the application of the trepan, fungous excrescences are apt to shoot out from the different perforations in the bone. There is seldom, however, any reason for our attempting to remove them, as is commonly done, by compression, caustic, or ligature; for in general they disappear soon after the ossifying process is completed

in the several openings. But when this does not happen, and when they still continue to prove troublesome after the rest of the cure is accomplished, they may with safety be taken away, either with caustic or the scalpel.

In various points of importance treated of in this chapter, I have advanced opinions, and recommended modes of treatment, different from those which hitherto have prevailed : but however diffident I am in first dissenting from an established doctrine, if my own experience is found to justify this dissent, the more respectable the authority by which the contrary opinion is supported, the more investigation appears to me to be necessary.

But in proposing modes of practice different from what are sanctioned by long custom, I have never been conscious of being actuated by a spirit of innovation, or a desire of appearing singular : and whenever I have ventured to dissent from men of known abilities, I have always endeavoured, with fairness and candour, to state the reasons of my doing so, and the grounds upon which my opinions are formed : at least this has been my intention, and I hope it will appear to others that I have done so.

CHAPTER XI.

OF THE DISEASES OF THE EYES.

SECTION I.

Anatomical Description of the Eye.

THE object of this chapter is the surgical treatment of the diseases of the eye and parts with which it is connected : hence it will comprehend the diseases of the lachrymal passages ; but, in the first place, it will be proper to give an anatomical description of the parts in which these diseases are seated.

Minuteness on this subject would lead to a greater length than the extent of this work will admit, nor does it appear to be necessary : I shall therefore give only such an account of these parts, as the nature of the diseases, and the operations to be described, seem to require.

The eyes, and part of their appendages, are placed in two bony cavities, termed the orbits, formed by a conjunction of the inferior part of the frontal bone with several other bones of the head and face ; namely, with the ossa maxillaria, ossa malarum, ossa unguis, os ethmoides, os sphenoides, and ossa palati. All the upper part of the orbits is formed by the orbital processes of the frontal bone ; and the same processes form a considerable vacuity in each orbit towards the external canthus of the eye, in which the glandula lachrymalis is lodged. The inferior part of the orbits is formed by the ossa maxillaria and ossa malarum, which also form part of the sides or angles of each orbit ; the former stretching towards the internal canthus, and the latter towards the external angle of the eye. The

bottom or back part of each orbit is formed by the ethmoid, sphenoid, and a small portion of the palate bones ; and a small part of the internal corner or angle of each orbit is filled up by the os unguis.

As this last mentioned bone, the os unguis, is frequently the subject of a nice operation, it is more particularly necessary for surgeons to be well acquainted with its structure and situation. A considerable part of it is so thin and brittle, that a perforation may be made in it with very little force ; with less, indeed, than is commonly imagined ; for not being thicker than fine paper, the point of a sharp instrument is easily made to pass through it. The internal surface of the os unguis, which in part covers the cells of the ethmoid bone, is somewhat rough ; but its external surface is smooth, and consists of two depressions or concavities divided by a ridge. This ridge forms the boundary of the orbit at the internal canthus of the eye, and one of these depressions forms the very point or angle of the orbit ; while the other concavity, which lies between this ridge and the nasal process of the maxillary bone, serves to lodge in its upper part, where it is largest, the lachrymal sac, and below it protects the duct leading from this sac into the nose, where it terminates immediately below the superior edge of the lower os spongiosum. The nasal duct of the lachrymal sac admits a probe of the size of a crow's quill ; and it continues of this diameter till within a little of its termination in the membrane of the nose ; where, by running in an oblique direction between the layers of this membrane, in a manner similar to the termination of the ureters in the bladder, it is in general found contracted to a very narrow point.

The principal part of each orbit is filled by the ball or globe of the eye, a body composed of several membranes or coats, inclosing fluids or liquors of different consistences, improperly termed the humours of the eye.

Anatomists have considered the coats of the eye as numerous, but three only can be distinctly traced ; namely, the sclerotic, the choroid, and the retina. The former has indeed been supposed to consist of different coats, to all of which names have been appropriated, namely, the tunica albuginea, the cornea opaca, cornea lucida, &c. ; and even the choroid has been supposed to be formed of different tunics : but although a tedious maceration may separate some of these parts into different lamellæ, the knife of the anatomist is not able to do so ; and as distinctions of this kind can tend to no useful purpose, they ought not to be retained.

The fat and different muscles of the eye being separated from it, the sclerotic is the first coat that presents itself ; and it is found to surround the whole globe of the eye, which is not the case with any of the others. In the anterior convex part of the eye, which in a healthy state is always transparent, this membrane is in general termed the cornea. The posterior part of it is thick, strong, and perfectly opaque : it is this part of it that has commonly been termed the sclerotic coat, or, as I have already observed, the opaque cornea. But although the transparent cornea can be easily separated into different layers, which cannot be so readily done with the other ; a circumstance which has led some anatomists to consider them as distinct coats ; yet as the one is evidently a continuation of the other, and as they are both supplied with the same blood vessels, there seems to be no good reason, as I have just remarked, for the distinction being retained.

All the opaque part of the sclerotic coat is lined with the second coat of the eye, the choroides ; a dark or dusky red coloured membrane, which every where adheres to it with firmness, particularly at a small distance behind the commencement of the transparent cornea, where a circular whitish ring is formed by this junction of the choroides with the sclerotica, commonly termed the ligamentum ciliare. From this

junction of the choroid with the sclerotic coat, a perforated kind of curtain or septum is produced, which from the variety of its colours, is termed the iris. The perforation in the centre of this membrane is termed the pupil, and serves to admit the rays of light to the bottom of the eye.

Towards the middle of the iris, we perceive a number of radiated lines running from the circumference to the centre : these are denominated the ciliary processes, and on their action the contraction and dilatation of the pupil appear to depend ; for it seems to be doubtful, whether any circular fibres exist in the iris or not.

Ruyfch, as well as other anatomists, have imagined that the tunica choroides consists of two distinct coats, and the iris has been in general considered as a continuation of one of these ; but later discoveries tend to shew that the choroides in the human eye consists of one simple indivisible tunic, and that it is different in every respect from the iris.

The third and most internal coat of the eye is the retina, which seems to be an expansion of the optic nerve. It does not line the whole cavity of the eye, but appears to terminate over the anterior edge of the sac or capsule of the vitreous humour to be hereafter described.

Vision we suppose to be produced by the rays of light being applied in a certain manner to the retina : it is therefore obvious, that a sound state of the optic nerve, by which this membrane is produced, is highly necessary for the purposes of vision, and we conclude with much probability, that the nerve is sound, when the usual contraction and dilatation of the pupil take place on light being applied to, or removed from, the eye : for in a healthy state of this organ, such a connection subsists between the optic nerve and the iris, that the latter always contracts or dilates, just in proportion to the quantity of light thrown upon the other.

These are the only proper coats or coverings of the eye ; but there are two membranous expansions which likewise cover a considerable portion of the back part of the globe, which by many have been enumerated as part of its tunics ; namely, the albuginea, and tunica conjunctiva : the former, however, is formed entirely of the tendinous attachments of the muscles of the eye ; and the latter is a continuation or reflection of the membrane that lines the internal surface of the eyelids.

The cavity formed by these coats or membranes, is filled with three kinds of substances, or humours as they are commonly termed ; namely, the vitreous, the crystalline, and the aqueous. All the posterior part of the eye is filled with the vitreous humour, which is perfectly transparent, and of a gelatinous consistence : this humour is completely surrounded by a very delicate membrane, which likewise appears to pass through the substance of this gelatinous mass, and to confine it in a kind of cellular texture or network. In the anterior surface of the vitreous humor, we find a depression exactly opposite to the pupil, for the purpose of receiving the crystalline humour, a substance of a much firmer texture than itself, and of a rounded or lenticular shape. This body, or the lens as it is commonly termed, is retained in its situation by a very fine membrane or capsule, which appears to be formed by the capsule of the vitreous humour, separating or dividing at this part into two distinct laminæ. It has indeed been supposed, that the crystalline lens has a cyst or capsule peculiar to itself ; but I have never been able to distinguish it, nor has any sufficient evidence ever been given of this having been done.

The whole anterior part of the eye, from the termination of the vitreous and crystalline humours, to the internal surface of the transparent cornea, is filled with the aqueous humour, a thin transparent fluid. By the iris, already described, this part of the eye is divided into two unequal departments : the smallest of

these, which is scarcely a tenth of an inch in width, and lies between the iris and the capsule of the vitreous humour, is termed the posterior chamber; and the other, which is considerably larger, and occupies the whole space from the iris to the cornea, is called the anterior chamber of the eye. Although these two divisions of the eye, however, are perfectly distinct, it is obvious that they must communicate at the pupil, the opening in the centre of the iris.

The muscles of the eye are six in number; namely, the levator oculi, the depressor, adductor and abductor, the obliquus superior and inferior. By these, all the motions of the eye are performed. The first five arise from near the bottom of the orbit, at no great distance from each other; and the last originates from the orbital process of the maxillary bone, near to its junction with the os unguis. They are all inserted into the tunica sclerotica, below the adnata or tunica conjunctiva.

The constant motion of the eye requiring it to be kept soft and moist, it is for this purpose plentifully supplied by a fine transparent fluid, the tears. This secretion is now known to depend in a great measure upon a large glandular body, the glandula lachrymalis, seated immediately above the eye, in the depression that I formerly mentioned in the os frontis, near to the external angle of the orbit. There is likewise in the internal or great angle of the eye, a small red coloured body, termed the caruncula lachrymalis, which till of late was supposed to be the principal origin of the tears. This, however, is not the case; and there is even reason to doubt whether this substance is of a glandular nature or not.

But although the tears are chiefly secreted by the glandula lachrymalis, there is much reason to imagine that they are partly produced by exudations from the whole surface of the eye, as well as from the membrane of the eyelids. But this being in some

measure foreign to our subject, I shall not at present consider it further.

The eye, and its appendages, that have just been described, are supplied by several arterial branches, either directly from the internal carotid, or from the maxillary arteries. None of these, however, are of any considerable size; at least, before reaching the eye, they are in general found divided into branches of no great magnitude; a circumstance of some importance for practitioners to recollect: for, on the supposition of these arteries being larger than they are, surgeons have commonly been deterred from operating with that freedom on the eye which they otherwise might do, particularly in the total removal or extraction of the eyeball; an operation to be hereafter described. The veins of the eye terminate partly in the external, and partly in the internal jugular veins.

Vision, as I have already observed, depends in a great measure on the optic nerve which passes in from the brain at the bottom of the orbit; but the eye does not depend entirely upon this nerve: it receives branches from several others, particularly from the fourth, fifth, and sixth pairs.

The globe of the eye and other parts contained in the orbit, are covered by two very moveable membranes, called palpebræ, or eyelids, formed chiefly of the skin and a smooth fine membrane already described, the tunica conjunctiva, with an intermediate thin cartilaginous body termed tarsus, on which the cilia or eyelashes are placed. Both the upper and under eyelids are supplied with this thin cartilage; at the extreme border of which, towards the roots of the cilia, a number of small follicles are placed, named after their discoverer, the follicles or glands of Meibomius; from whence is poured out a viscid sebaceous matter, commonly termed the gum of the eyes.

The motion of the eyelids is performed entirely by two muscles, the orbicularis palpebrarum, and the levator palpebræ superioris. The former is common to

both the eyelids: it originates by a small tendon at the inner angle of the eye, and by fine fleshy fibres from the orbital process of the maxillary bone, and is inserted by a small round tendon into the nasal process of the same bone. A few of the tendinous fibres of this muscle are spread upon, and seem to be inserted into, the anterior surface of the lachrymal sac. The use of this muscle is to draw the eyelids together, and to compress the eyeball.

The levator palpebræ superioris originates from the bottom of the orbit, and is inserted into the membranous and cartilaginous parts of the upper eyelid: the sole use of this muscle seems to be to raise this covering of the eye.

I have already described the lachrymal sac and duct, by which the tears are conveyed to the nose: we have now to attend to the manner in which they pass from the eyes to the sac. After the tears have moistened the eyes, they would at all times be falling over the cheeks, if not carried off in some other manner: a very beautiful mechanism, however, is employed by nature for this purpose.

Near to the internal angle of each eye, we perceive two small points or protuberances, one on the border or edge of the upper eyelid, and the other exactly opposite to it on the under eyelid. In the centre of each of these there is a small hole or opening, termed the punctum lachrymale, which we find to be the mouth of a small conduit leading to the lachrymal sac, and by which the tears are conveyed to it. These canals are of such a size as to admit a probe somewhat larger than a hog's bristle. They are each about four tenths of an inch in length; and after running in an oblique direction along the edge of the eyelids, they commonly join into one common trunk immediately before they enter the lachrymal sac, somewhat more than the tenth of an inch below the upper end of it.

The protuberances on which these canals originate, are evidently irritable, as may readily be seen on their

being touched with a probe or any acrid matter. This renders it probable that they are endowed with the power of absorbing the tears ; and this fluid we find is at all times applied to the mouths of them, by a kind of membranous production of the tunica conjunctiva, of a semilunar form, lying in the internal angle of the eye. This membrane is by anatomists termed *valvula semilunaris*. In order, however, to render the anatomy of these parts as intelligible as possible, a circumstance of much importance in the treatment of the diseases to which they are liable, I have given a delineation of the whole in Plate XII. fig. 1.

Being now prepared to enter on the consideration of the diseases of these parts, I shall proceed accordingly to this part of our subject.

Inflammation of the eye frequently occurs, and is productive of many other diseases to which this organ is liable : I shall therefore enter first on the consideration of this symptom, and shall afterwards treat of the following diseases and operations peculiar to these parts : wounds of the eyelids and eyeballs ; tumors of the eyelids, such as abscesses, melicerous and steatomatous collections and warts ; inversion of the cilia or eyelashes ; eversion of the eyelids ; concretion of the eyelids ; fleshy excrescences on the cornea ; abscesses in the globe of the eye ; dropical swellings of the eyeball ; blood effused in one or both chambers of the eye ; ulcers on the cornea ; specks or films on the transparent part of the eye ; protrusion of the globe of the eye from the socket ; cancerous affections of the eye, and extirpation of the eyeball ; of artificial eyes ; of cataracts, and the means of removing them by depression and extraction ; obliteration of the pupil, by concretion of its sides and adhesion of the iris to the capsule of the crystalline and vitreous humours ; and, lastly, of the fistula lachrymalis.

SECTION II.

Of Ophthalmia, or Inflammation of the Eyes.

THE eyes and their appendages, like every organised part of the body, are liable to inflammation; and the symptoms which it excites vary according to the particular seat of the disease. Thus the symptoms arising from inflammation of the retina and other deep seated parts, are different from those which proceed from inflammation of the external coverings of the eye; and these again are different from those which arise from an inflamed state of the eyelids.

The most frequent symptoms attending inflammation of the eyeball, are, a preternatural redness of the adnata, owing to a turgescient state of the blood vessels; pain and heat over the whole surface of the eye, attended with a sensation of motes or extraneous bodies rubbing upon the eyeball, and in most instances a plentiful effusion of tears. All these symptoms are increased by motion of the eye or of its coverings, and likewise by exposure to light. We judge too of the depth of the inflammation by the degree of pain which exposure to light excites. When the pain induced by light is severe, there is always cause to suspect that the parts at the bottom of the eye, are inflamed; and again, when the pain is trifling; we conclude that the inflammation is confined to the external parts of the eye. We also find, when the inflammation is superficial, that the symptoms are in general local, and confined entirely to the eye; but, when more deeply seated, severe shooting pains are frequently felt through the head, and fever very commonly prevails.

During the whole course of the inflammation, there is for the most part a plentiful flow of tears, which frequently become so hot and acrid as to excoriate the neighbouring parts; but it often happens that, to-

gether with the tears, a considerable quantity of yellow purulent like matter is discharged; and, when the inflammation has either spread to the eyelids, or has been seated there from the beginning, as soon as the tarfi become inflamed, a discharge takes place of a viscid glutinous kind of matter, which adds greatly to the patient's distress, as it tends to increase the inflammation, by cementing the eyelids so firmly together, as to render it difficult, particularly in the mornings, to open them.

These are the appearances of inflamed eyes in the first stages of the disease; but when of long duration, it proceeds, like inflammation of other parts, to terminate either in suppuration, or in the effusion of a fluid not convertible into pus. Inflammation of the eyes has also been known to terminate in mortification; but this is a rare occurrence; and we even know that it does not readily end in suppuration.

Inflammation of the eyes is induced by various causes: whatever tends to produce inflammation in other parts, will be attended with similar effects, when applied to the eye; but the peculiar mechanism of this organ renders it liable to be acted on by causes which may with impunity be applied to other parts of the body. Thus, much exposure to smoke tends often to induce inflammation of the eyes: and it also happens from the application of much light; particularly from much exposure to the rays of the sun; to the influence of a large fire; or to the effects of snow: and the introduction of lime, sand, or any other extraneous body, between the eyelids and the eye, is very universally attended with this effect.

The consequences, however, of these causes, are not in general permanent; for, in recent cases, a removal of the cause is, in most instances, attended with the cure of the disease. It is that variety of inflammation which originates from disease of the system that proves most obstinate, and which is, therefore, most to be dreaded, particularly that which occurs from scrofula

and lues venerea ; for we find by experience, that few symptoms in either of these diseases prove ever so tedious as those inflammatory affections of the eyes with which they are often attended. Whilst a venereal or scrofulous affection subsists, it is in vain to expect a cure of any inflammation that may exist. Such remedies ought, therefore, to be employed as are known to prove most powerful for the removal of the disease of the system, at the same time that we attend to the local treatment of the eyes. It is the management of this local affection that we are now to consider.

In the treatment of inflamed eyes, the indications to be kept in view are, to remove any extraneous substances that might tend to excite irritation ; to diminish pain and irritability already induced ; to remove the turgescence of the blood vessels of the eyes ; and to prevent a return of the disease.

When inflammation is induced by sand, or any other extraneous body acting on the eye, nothing will prove materially useful, till the cause of irritation is removed. With due pains, the eyelids may be so far separated with the fingers alone, as to admit of a clear view being obtained of a considerable portion of the eyeball. But this will be more effectually done, if an assistant, either with his fingers alone, or by means of a flat curved hook, such as is represented in Plate XIV. fig. 6. raises the upper eyelid, while the surgeon himself depresses the other. Any extraneous body discovered in this manner, may be taken out with the end of a blunt probe, covered with a bit of soft linen or silk ; or, if any sharp pointed substance is fixed in the eye, it will be most easily removed with small forceps.

It often happens, however, even when we are certain, from the feelings of the patient, as well as from other circumstances, that the inflammation is kept up by some cause of this kind, that nothing is discovered on inspection. In such circumstances, some advantage is often derived from injecting tepid water, or milk

and water, between the eyelids and eyes, by which sand and dust are often washed out, when they cannot be removed in any other manner : the easiest and most effectual method of throwing in these liquids, is by means of a bag of elastic gum; fitted with a short ivory pipe. With this bag, a surgeon can easily perform all that is necessary without assistance, which with a common syringe he cannot so readily do. One of these bags, properly mounted, is represented in Plate XIV. fig. 3.

In this manner, and by bathing the eyes frequently in warm water, they may, in general, be entirely cleared of all extraneous bodies : but, when the inflammation has subsisted for some time, it often continues after the cause by which it was produced is removed ; in which event, other remedies must be employed. When the pain is considerable, and the pulse quick, full, or hard, it becomes necessary to take blood in proportion to the strength of the patient. The bowels should be kept open with brisk purgatives ; a low diet should be continued for a length of time, proportioned to the violence of the disease ; the body should be kept cool ; light should be excluded from the eyes, and they should be constantly covered either with soft linen soaked in a weak saturnine solution, or with cataplasms applied cold, composed of this solution and crum of bread. In this manner, very severe degrees of inflammation are often removed ; but cases frequently occur, which resist these and all the remedies usually employed.

In such instances, we find, that discharging blood from the contiguous parts, or even from the blood vessels of the eye itself, proves sometimes useful, when all other means have failed. When a large quantity of blood is to be discharged, it is done with most advantage from the jugular veins or temporal arteries ; even the last of which, as I have already endeavoured to shew, may be opened with entire safety.* In ad-

* Vide Chapter VIII. Sect. 8.

vifing local bloodletting, we do it either from the parts contiguous to the eyes, or from the veffels of the eyes themfelves ; and the means we employ for it are, cupping and fcarifying the temples, leeches applied as near as poffible to the eyes, and fcarifying the blood veffels of the eyeball or eyelids. The operation of cupping and fcarifying, and likewise the method of applying leeches, have been already defcribed.†

In a great proportion of cafes, an early and a plentiful difcharge of blood from the temporal artery or jugular vein proves fucceffful ; but, where ophthalmia is either deep feated, or of long duration, I have commonly found, that little advantage is derived from our taking blood in this manner, and that no remedy answers fo well as a free difcharge of blood from the veffels of the inflamed eye. As this operation, however, the divifion of the blood veffels of the eye, has always been confidered as nice and hazardous, it has feldom been praftifed ; but any furgeon with a fteady hand may perform it with fafety, and without injuring the eye itfelf.

Various methods have been propofed for dividing the veffels of inflamed eyes. It has been attempted with a brush compofed of the beards of barley ; by drawing the fharp fpiculæ acrofs the part to be fcarified, a number of veffels are thus penetrated and divided. This was firft put in praftice by an Englifh oculift, Mr. Woolhouse, about the beginning of this century, and it was confidered as an improvement on the means which till then had been in ufe for the fame purpofe, from the days of Hippocrates and Celfus ; which were, rubbing the parts to be fcarified either with a piece of rough pumice ftone, or with the fpiculæ of thiftles, till the blood veffels were fufficiently lacerated for difcharging as much blood as was neceffary. It has likewise been propofed to raife or elevate the veffels to be divided with the point of a needle, and then, with fciffars or a fcalpel, to cut them acrofs.

† Vide Chapter VIII.

All these modes, however, of scarifying the eye, proceed from timidity ; they give much unnecessary pain, and they do not answer so well as scarifications made with a sharp cutting instrument. Practitioners have commonly been afraid of attempting this operation with an instrument of this kind ; but any person accustomed to chirurgical practice, will find that it may be done both with ease and safety. In the hands of a steady surgeon, it may be done with the shoulder of a common lancet ; but, with a view to prevent the eyelids from being injured by one edge of the instrument, while the eye is scarified with the other, I have delineated a small knife in Plate XII. fig. 4, and another in Plate XXIII. fig. 5, with either of which the operation may be done with safety.

In this operation, two assistants are necessary, one to stand behind the patient, to support his head, and the other to secure his hands. This being done, the surgeon, standing or sitting before the patient, with the fore and middle finger of one hand should separate the eyelids, so as to expose as much of the eyeball as possible ; whilst, with the instrument I have mentioned in the other, all the turgid blood vessels should be divided. This is most effectually done by passing the point of the instrument below the enlarged blood vessels, and thus cutting them from below upwards. In general, we wish to avoid the transparent cornea in this operation, and to confine the scarifications to the albuginea or cornea opaca ; but when the vessels of the transparent cornea are much distended, they may be divided with ease and safety. I have often found it necessary, to divide the vessels of this part of the eye, and no inconvenience ever ensued from it.

On the inflamed blood vessels being cut, we should endeavour to promote a discharge of their contents ; for which purpose nothing answers so well as bathing the eye in warm water, either by means of an eye-

cup, or with pieces of soft old linen, frequently immersed in the water.

A plentiful discharge of blood from the vessels of the eye often gives more relief in the pain arising from ophthalmia, than any other remedy we employ. But when it either does not succeed, or when not agreed to by the patient, opiates applied to the eye frequently answer. A few drops of a strong solution of opium in water being dropped into the eye, prove sometimes successful; but the common laudanum of the dispensatories, particularly when wine is employed as the menstruum, proves often effectual when the watery solution of opium has been used in vain.

The pain arising from ophthalmia, as well as every other symptom which it excites, is frequently relieved by shaving the head, and washing it from time to time in cold water. Blisters applied behind the ears, on the neck and temples, are in some instances used with advantage; also drains, formed either by pea issues, or with a cord in the nape of the neck.

In some stages of the disease, much distress is experienced from a thick viscid secretion, that glues the eyelids together. This takes place in some degree in almost every case of ophthalmia, particularly in the mornings, and when the tarfi or extreme borders of the eyelids are much inflamed. In this case, indeed, the inflammation soon terminates in a number of small ulcerations, which frequently may be distinctly seen round the whole circumference of the cartilaginous border of the eyelids. From these this glutinous matter, which in some measure is produced by the sebaceous glands of these parts, is poured out in great quantities; and unless some means are employed for curing the ulcers, scarcely any remedy will remove the inflammation of the eyes.

A small portion of any emollient ointment, being from time to time inserted between the eyelids, proves often useful in preventing this viscid matter from fixing them together; but the relief obtained in this

manner proves only temporary. Some addition must be made to the emollient for the purpose of healing the ulcers from whence the matter is discharged, otherwise no permanent advantage ensues from it; and when the disease is local, and not connected with scrofula, the cure of the ulcers will commonly be followed by the cure of the inflammation by which they were produced. With this view the calx of zinc, or lapis calaminaris finely levigated, may be added to an equal quantity of an emollient ointment composed of wax and oil; but no application proves so generally useful as ointments of the mercurial kind; and perhaps the best of these is the unguentum citrinum of the Edinburgh Dispensatory, mixed with an equal quantity of hog's lard, and made soft with oil; or the blue mercurial ointment of different dispensatories, prepared with quicksilver and lard. One ounce of quicksilver, triturated with four ounces of lard, is, for this purpose, a very useful remedy. Every night and morning the ulceration on the eyelids should be covered with a little of this, at the same time that a small portion of the ointment should be inserted between the upper and under eyelids, while a weak saturnine or vitriolic solution should be employed once or twice daily, as a wash.

It is almost unnecessary to remark, that no light should be admitted to the eyes, not merely while they continue inflamed, but as long as it excites pain: even when one eye only is inflamed, care should be taken to keep them both covered; for we know from observation, that the exposure even of a sound eye to light, while the other is inflamed, almost constantly proves hurtful to both.

The eyes, however, should never be kept closely tied down: by keeping them too warm, much harm is often done. They should be lightly covered with a loose bandage either of silk or soft linen; and when the patient is able to go abroad before his eyes can bear much light, the bandage in Plate XIV. figure 1,

may be used with advantage : by means of it, the quantity of light admitted to the eyes is easily regulated, whilst the eyes themselves are neither compressed nor kept too warm.

By due perseverance in this kind of course, local inflammation of the eyes is in most instances removed ; but where it proceeds from, or is connected with scrofula or lues venerea, no remedy will prove successful, till the disease of the system is removed.

With a view to prevent those frequent returns of ophthalmia to which many are liable, various remedies have been recommended, particularly astringent lotions. They seldom, however, answer any good purpose ; and when too strong, they are very apt to do harm. During the continuance of inflammation, we often derive advantage from bathing the eyes with weak solutions of sugar of lead, or white vitriol ; but they have no effect in preventing a return of inflammation. For this purpose, nothing that I have ever employed proves so certainly useful as cold bathing. By keeping the head shaved, and immersing it daily in cold water, much may be done in preventing those frequent returns of inflamed eyes, to which many are liable. For the purpose of applying local bathing to the eyes, different means are employed ; but the most simple and most effectual is by means of a cup, represented in Plate XIV. fig. 2. This cup, which should be of an oval form, and somewhat larger than the eye, being filled with water, or any other liquid, and applied to the eye, if in this situation the eyelids are opened and moved about, the whole surface of the eye will be thus effectually bathed. As a preventative of ophthalmia, a liberal use of Jesuits' bark has also proved useful ; and we know from experience, that in periodical returns of the disease, it is almost the only remedy on which we have to depend. I need scarcely observe, too, when any cause is discovered by which inflammation appears to be excited, or kept up, that it ought to be avoided ; for if this precaution is neglected, no remedy will answer.

SECTION III.

Of Wounds of the Eyelids and Eyeball.

AS the cure of wounds has already been treated of in Chapter II. it may be considered as out of place to enter upon any part of the subject again ; but I judged it proper to reserve for this place a more particular consideration of wounds of the eyelids and eyeball.

In wounds of the eyelids, the parts may be divided either in a longitudinal or transverse direction with respect to the course of their muscular fibres. If the skin only is divided, or, if a wound penetrating the whole substance of the eyelid, is inflicted in such a manner as merely to separate the fibres of the orbicularis muscle from one another, all that we have to do is to draw the skin and other divided parts exactly together, and to retain them in this situation with slips of adhesive plaster. As in such circumstances no retraction can take place of the divided parts, they are easily retained ; and care should be taken that they are kept in this situation till they unite.

But when the orbicularis muscle is cut transversely, especially when a corresponding part of the tarsus or cartilaginous border of the eyelid is likewise cut, more care is requisite. If they are allowed to separate much, such a want of tone in the eyelid is apt to take place, as serves to interrupt its usual motions : and again, if the divided parts are drawn too tightly together, they impede the motion of the eyeball.

In transverse wounds of the eyelids, it is sometimes necessary to employ futures. The interrupted future is usually preferred ; but the twisted future answers better. The method of performing these futures having been described in Chap. VI. I have at present only to remark, that in the practice of either of them

upon the eyelids, much nicety and delicacy is required, otherwise much harm may be done, not only to the eyelids, but to the eye itself. When the twisted future is employed, the pins should be short and small, so as to run as little risk as possible of hurting the contiguous parts, and they should be made to pass not only through the skin, but into the fibres of the orbicularis muscle, otherwise little advantage will be gained by the operation: but they should not be carried entirely through the inner membrane of the eyelid. This would irritate and inflame the eye; and not being necessary, it ought to be avoided. If the skin is properly retained in its situation, with a few of the fibres of the muscle underneath, a better cure will be obtained than if the needles were made to pass through the whole substance of the eyelid; for in this manner the action of the muscle is preserved, whilst no risk is incurred of the eyelid being too much contracted; a circumstance very apt to occur when the whole thickness of the eyelid is penetrated by the futures.

It is almost unnecessary to observe, that in order to ensure success from this operation, the motion of both eyes should be as much as possible prevented, otherwise no union of the divided parts will be obtained; the eye will be irritated; inflammation will occur; and this will render it necessary to remove the futures before they have effected the purpose for which they were employed.

On the futures being finished, the eyelids should be closed and covered with a pledget of lint or soft linen spread with saturnine cerate, that the parts may be kept as easy as possible; and a compress of lint being laid over it, and another over the sound eye, the whole should be retained by a napkin over the head, tied in such a manner as to press equally and gently upon both eyes. Inflammation should be strictly guarded against; or if it has already taken place, we must endeavour to remove it by the means pointed out in the

last section ; and in the course of three days from the futures being inserted, they should all be removed ; for in this period, if the parts have been kept in contact, their union will be complete.

We have hitherto been supposing, that the parts are only simply divided ; and when replaced, that the eye is found to be as completely covered as before : but it sometimes happens, that they are not only divided but destroyed ; in which case, when such a portion of the eyelids is removed, as to prevent the parts that remain from being brought into contact without impeding the motion of the eye, it will be more prudent to leave them at some distance from each other ; and by treating them with light dressings, to trust to nature for supplying the deficiency, by a new production of cellular substance.

The mechanism of the eyelids is peculiarly adapted for the protection of the parts beneath from too free an admission of light, air, and dust ; but no possible structure could prevent them from suffering by injuries of a different kind : we accordingly find, that the eyeball is liable, like other parts of the body, to wounds, contusions, and other injuries.

As the bones at the bottom of the orbit are in some parts extremely thin, wounds of the eye which penetrate deep prove dangerous from the near contiguity of the brain : but superficial wounds, that penetrate only the anterior part of the eye, although they may destroy the beauty and utility of the organ, are not in other respects to be considered as hazardous. Wounds of this part, however, of whatever kind they may be, require at all times the greatest care and attention ; not only with a view to the preservation of sight, but in order to prevent or obviate the effects of inflammation, a symptom which they very commonly induce.

Wounds of the transparent cornea, when directly opposite to the pupil, most frequently induce either a total or partial loss of vision ; for the cicatrix that succeeds very commonly remains opaque during life :

but although in this respect wounds of the anterior part of the eye are always to be dreaded, they seldom inflame so much as wounds of equal extent in the sclerotica or opaque cornea, which are always more painful, and productive of more hazard.

In other parts of the body, a small punctured wound is more to be dreaded than an extensive cut ; but in the eye, the risk arising from wounds is most frequently in proportion to their extent ; a circumstance which with surgeons ought to have influence in the preference which they give to the different operations on the eyes : it is not the pain arising from these operations to which I allude, and which frequently occurs in a greater degree from punctures than from very extensive cuts ; but it is the risk induced by large wounds, of discharging the humours or contents of the eye, by which vision, if not entirely destroyed, seldom fails to be injured ; by which the eye is often so much diminished, as to sink almost to the bottom of the orbit : I shall however, when treating of cataract, have occasion to consider this subject more fully.

In the treatment of wounds of the eyeball, to prevent or remove inflammation should be considered as our most important object. When a wound in the eye is large, it is scarcely possible to prevent the humours from being discharged ; for the natural and usual action of the muscles necessarily forces them out. In this case, no benefit is derived from the skill of the practitioner, and the use of the eye is immediately lost : but for one eye that is destroyed in this manner, twenty are ruined by inflammation, either from its being so violent that no remedy can lessen or remove it, or from its being too easily treated at first, and allowed to proceed too far before the necessary remedies are employed : in every wound, therefore, of this organ, all those means should be immediately advised, which, by experience, we know to prove most effectual in the prevention of this symptom ; but these

having already been fully mentioned in Section II. of this Chapter, it is not necessary to enumerate them again.

In wounds of the eyeball, the structure of the parts renders it impossible to diminish the extent of the opening: the parts in this situation cannot, as in the eyelids, be placed in contact, and retained with sutures: nothing of this kind being here admissible, all that art can attempt, is, together with a strict antiphlogistic regimen, to keep the eye lightly covered with a pledget of any emollient ointment; to bathe it from time to time with a weak solution of lead; and when the pain becomes severe, to give adequate doses of opium.

In extensive wounds of the eye, attended with an entire discharge of its contents, permanent blindness, with the usual deformity induced by the sinking of the eyeball, must necessarily succeed; but in wounds of lesser extent, we have it frequently in our power, by due attention to the means that I have advised, to remove symptoms which otherwise might end in the greatest danger.

SECTION IV.

Of Tumors of the Eyelids.

SMALL tumors occasionally form on the eyelids, which by impeding their motion, and rubbing on the globe of the eye, are apt to excite a great deal of distress.

The contents of these tumors are various, and of different degrees of firmness. Towards the internal angle of the eye, and most frequently on the under eyelid, near to the lachrymal punctum, small tumors are apt to form, chiefly of the inflammatory kind, and

in this country commonly termed the *stye*.* They begin with a sensation of fulness, stiffness, and uneasiness in the internal canthus of the eye. At first the skin is scarcely discoloured; but if the tumor proceeds to suppuration, it becomes first of a pale red, and afterwards yellow, when it commonly bursts and discharges a thick purulent matter. The *stye* is a tumor altogether inflammatory, and should be considered indeed in no other light than a common boil or abscess. The only circumstances in which it differs from boils in other parts of the body, are, the colour of the skin not being of such a deep red at first, and its advancing more slowly to suppuration. This, however, proceeds evidently from the peculiarity of its situation; for the matter being seated between the tarsus and internal membrane of the eyelid, the firmness of the cartilage prevents the skin which covers it from being much discoloured.

These are the tumors that prevail most frequently on the eyelids; but they are also liable to others, in common with other parts of the body.

The first of these that I shall mention is commonly of a round form, and somewhat soft or compressible: it seems to move or roll when pressed upon; the skin retains its natural appearance; and from the contents of it when laid open being of a fatty nature, we term it a *steatoma*. The soft white matter, of which these tumors are composed, is always surrounded with a firm membranous cyst.

Small tumors or excrescences form occasionally on different parts of the eyelids, in some instances, with narrow pendulous necks; in others, with thin broad bases. Some, being of a soft fleshy consistence, are termed *sarcomatous* tumors; whilst others, being hard and firm, are denominated *verrucae*, or warts.

In the treatment of the *stye* or small boil, so frequently met with near the internal angle of the eye,

* This is a variety of the *Hordeolum* of Sauvages and other nosologists

some doubt has arisen of the propriety of bringing them to suppuration; and by many it is even said, that we should in perhaps every instance, by means of vitriolic and other astringent applications, attempt to remove them by resolution or discussion. Almost the only reason, however, that can be given for this is, the trouble of bringing them to suppuration: but on considering the advantage to be derived from it, and the hazard of injuring the eyelids, by frequently attempting to repel what nature means to discharge, we will not hesitate in the choice of our method of cure. By bringing these tumors to suppuration, we incur indeed some additional trouble; but it is seldom considerable: and as soon as matter is fully formed, if it does not burst and discharge itself, opening the tumor with the point of a lancet procures complete relief, and the sore commonly heals quickly without further trouble.

As soon therefore as a sty is clearly formed, we should endeavour, by a frequent renewal of warm emollient poultices, to bring the tumor to suppurate, and then to discharge the matter with a lancet, if it does not previously burst of itself. I know from experience that the practice is perfectly safe; that the pain attending it is inconsiderable, and that it tends to prevent these tumors from ending in others of a more inveterate kind, which, in the usual method of treating them, is apt to happen. After this kind of boil has suppurated and discharged its contents, bathing the parts with a weak saturnine or vitriolic solution proves useful; in the proportion of a grain of saccharum saturni, or vitriolum album, to each ounce of water: it tends to remove any uneasiness that remains, and to restore the parts to their usual tone.

All tumors of the eyelids of a firm consistence, whether steatomatous or warty, as they cannot be made to suppurate, should be removed by excision, as soon as they impede in any degree the motion of the eye. As long as they remain small, they are for the most part inoffensive, and are therefore overlooked; but

whenever they begin to increase, they should immediately be taken off.

In all warty excrescences of a small size, as well as in those of the sarcomatous kind, we are commonly advised to remove them with caustic ; or if the base is small, to do it with a ligature. This, however, should never be done : no reason indeed can be given for it but timidity either on the part of the patient or of the operator : whether we employ caustic or ligatures, the cure must prove tedious ; they commonly excite inflammation and irritability of the eye, and they frequently give more pain than is ever done by the scalpel : in the removal therefore of these tumors, we should trust solely to excision, an operation neither attended with difficulty nor hazard.

The patient being seated opposite to a window, and his head secured by an assistant, if the tumor cannot be laid hold of with the fingers, a ligature should either be passed round it, or pushed through it with a needle, in order to enable the operator to raise it by pulling it gently from the parts beneath ; and this being done, if its base is narrow, it may be removed at once ; but when extensively attached to the neighbouring parts, it is better by slow dissection to ensure its total removal, than by proceeding quickly to incur the risk of allowing part of it to remain, or to require further trouble afterwards in removing it. On the operation being finished, a piece of soft lint should be applied to the sore, and retained with a slip of adhesive plaster ; by which the sore very commonly heals easily, without further trouble.

When, again, the tumor is of the steatomatous or encysted kind, instead of dissecting it off covered with the skin that surrounds it, by which a troublesome unseemly cicatrix is always produced, it answers better merely to divide the skin by a simple incision with a small scalpel. This should be done from one end of the tumor along the most prominent part of it to the other ; and a strong waxed thread being passed through

the centre of the cyst, this should be given to an assistant, in order to separate or raise it from the parts beneath, while the surgeon himself, with cautious dissection, endeavours to separate the skin and cellular substance; and this being done, the tumor is easily removed by the ligature.

When, in the course of the operation, it has become necessary to divide the internal membrane of the eyelid, no dressing should be applied to the sore, as the most inoffensive we could employ would irritate and inflame the globe of the eye. All that, in such circumstances, should be done, is, to lay the lips of the sore as nearly together as possible; and to remove as frequently as is necessary, any superfluous matter that may happen to form in it. But when it is found necessary to cut entirely through the eyelid, in order to render the cicatrix neat, the lips of the wound should be drawn together with the fingers, and retained with slips of adhesive plaster till they unite.

In the extirpation of these tumors, when the cyst is firm, and the contents of the steatomatous kind, the bag should be preserved entire, as in this state it is more easily and more effectually removed by doing so than in any other manner: but whenever the cyst is thin, and especially when the contents of it are fluid, it is commonly difficult, and in some instances impossible, to separate the teguments from it beneath, without laying it open. In this case, after dividing the skin and cellular substance, by making an incision along the most prominent part of the tumor, it is better to open the cyst at once by a large puncture with the point of a lancet, in order to discharge the matter contained in it, than to make any attempt, as is commonly done, to preserve it entire; by which, in such circumstances, the operation is always rendered more tedious than it otherwise might be.

SECTION V.

*Of Inversion of the Cilia, or Eyelashes.**

THE eyelashes are in some instances so much inverted, or turned inwards upon the eye, as to excite much pain, by rubbing or fretting the coats of it: in which case, it becomes necessary to remove them.

This inversion of the cilia is produced by different causes: in some cases, it proceeds from a derangement of the hairs themselves, which leaving their usual direction turn in towards the eyeball: but more frequently it is produced by a cause of a more distressful nature, an inversion of the tarsus or cartilaginous border of the eyelid: this again is most commonly induced either by an unequal spasmodic affection of the orbicularis muscle of the under eyelid; for it is not frequently met with in the upper palpebra: or it occurs as the effect of a cicatrix upon the skin of this part, the consequence of some previous injury: in some instances, it is produced by tumors, forcing the eyelashes in upon the eye; and a relaxation of the external teguments of the eyelid has likewise been supposed to induce it. As the cause of the disease is various, so it is evident that the means of cure must likewise be so.

When it is found to originate solely from a derangement of the cilia themselves, without any inversion of the eyelids, we are directed by authors, in the first place, to pull out the inverted hairs with small pliers; and to prevent them from growing again, we are desired to burn their roots either with lunar caustic, or with the end of a red hot wire. Nay, some have pro-

* The Trichiasis and Entropium of authors.

posed that the whole cartilaginous edge of the eyelid in which the hairs are placed, should be entirely destroyed with caustic.

The pain and inflammation of the eye, induced by an inversion of the cilia, is in some instances indeed so distressful, and it is so difficult to prevent them from rubbing upon the eye, that none who have seen how obstinate they often are, will be surprised at the attention with which by many authors they have been considered : but it fortunately happens, that none of the painful remedies that I have mentioned are necessary ; for the same intention may in almost every instance be accomplished by means of a more simple nature.

When the eyelashes have remained long in a deranged state, and have acquired their full strength and elasticity, it is altogether impossible to bring them again into a proper direction. In such circumstances, therefore, they should all be pulled out by the roots ; for to cut them over, as is sometimes done, tends only to make them stronger and sharper than they were before. This being cautiously done with small forceps or pliers, relief is thus commonly obtained immediately : but unless we can prevent the new hairs from taking a similar direction, they very speedily advance so far as to induce a return of the disease. Nothing, however, can be done for this, till the new hairs have acquired some length ; but as soon as they are about half their usual length, and whilst they are yet more soft and pliable than they afterwards become, by turning them down upon the eyelid with the end of a blunt probe, and retaining them in this situation for two or three weeks, either by covering them with narrow slips of adhesive plaster, or with strong mucilage or glue by means of a small pencil, a complete cure may thus be commonly obtained. Much attention is necessary, indeed, in order to ensure success ; more, it must be acknowledged, than the disease commonly meets with : but due perseverance in the means I have mentioned, will in almost every instance answer ; and being an

easy method of obtaining relief in a very painful affection, nothing should be omitted that can tend to render the practice of it frequent and more certain.

When, again, the disease appears to originate from an unequal spasmodic exertion of the orbicularis muscle of the eyelid, no danger can ensue from making a slight incision on the internal surface of the under palpebra, of such a depth as to divide those fibres of the muscle that appear to be contracted, and by which the inversion of the cilia is produced. The only inconvenience that this can produce, is some degree of stiffness or immobility in the under eyelid, but which could not, even in the worst degree of it, be of much importance : and as no other remedy could in this variety of the disease prove useful, we should not hesitate to advise it. If, then, those fibres of the muscle that appear to be preternaturally contracted are freely divided, a cure of the disease will be obtained, and the incision will readily heal, without any dressings being applied. In this situation, indeed, no dressing can with propriety be employed ; but experience shews that it is not necessary ; for a cut in this part commonly heals easily.

When the cilia are found to be pushed in upon the eye, either by a tumor or cicatrix of some old sore, no cure can be obtained till the cause is removed. When produced by a tumor, this must be extirpated in the manner pointed out in the last section ; and when an old cicatrix falls to be removed, we do it by making an incision with a scalpel so as to surround the whole of it, and afterwards in a slow cautious manner dissect it off. When the pressure produced by the cicatrix has been the sole cause of the cartilage being turned inwards, the removal of the cicatrix will in general remove the disease ; and in this case the sore may be healed in the usual manner with easy dressings. But when it is found that the direction of the cilia is not immediately altered upon the cicatrix being removed, the lips of the sore should be drawn together, so as to

bring the edges of the divided skin into contact; and in this state they should be secured either with slips of adhesive plaster; or when this does not answer, it may be done either by the twisted or interrupted futures: by which means the points of the eyelashes may be turned entirely outwards, so as to accomplish in the most complete manner the intention of the operation.

It has also been supposed, as I have already remarked, that this disease may be produced by the external skin of the eyelid being too much relaxed. This, however, is what I never met with; and as we cannot suppose that these parts are retained in their situation by any exertion of the skin alone, it is not probable that any relaxation to which it is liable can have much influence in giving them a wrong direction; but if the contrary should ever be the case, the remedy to be employed is obvious: if the disease is of short duration, and the relaxation and loss of tone in the skin not considerable, bathing the parts frequently with a strong solution of alum in an infusion of oak bark, or with any other astringent, may lessen or remove it; but when this does not answer, our only resource is to remove all the relaxed skin with a scalpel: this being done, we draw the edges of the cut together, and retain them till they unite, either with adhesive plasters, or futures, in the manner already pointed out.

An inversion of the cilia constantly excites, as I have already observed, inflammation of the eyeball: this symptom, however, commonly subsides on the hairs being removed; but when this does not happen, those means must be employed which usually answer best for the removal of inflammation of the eyes, by whatever cause it may be induced. These having been enumerated in Section II. of this Chapter, it is not necessary to speak of them here.

I have already observed, that the inversion of the cilia occurs most frequently in the under eyelid. In some instances, however, we meet with it in the up-

per palpebræ; and in such cases it is scarcely necessary to remark, that the disease being exactly similar both in its causes and effects, the means employed for removing it should be the same. In the upper eyelid, a swelling occasionally occurs over the whole of it, by which the usual and natural exertion of its muscles is either much impeded, or perhaps entirely interrupted, and by which, too, the eyelashes may be so far inverted, as to produce this disease. In such cases, as the swelling of the eyelid is commonly of the dropical kind, it is more readily removed by two or three small punctures with the point of a lancet than by any other means: but when this does not prove sufficient, if it appears to be perfectly local, and not connected with an anasarctous swelling over the rest of the body, rather than allow vision to be much interrupted by a continuance of the swelling, it has been proposed to cut out a segment of the most prominent part of the skin, to discharge any water that may be contained in it, and to reunite the divided edges of the fore with futures. Nay, much time and ingenuity has been employed in the invention of instruments for effecting this operation neatly, and without much loss of blood; an occurrence, which in former times was always much dreaded. This should, indeed, be guarded against as far as is necessary; but in the operation of which we are speaking, it can never require much attention, for none of the blood vessels in those parts are of a size that can render it dangerous to divide them.

The instrument to which I allude acted solely by pressure: all the skin meant to be removed being included between two thin plates of brass or steel, a degree of pressure sufficient to destroy the circulation in the contained parts was applied and continued by means of a screw till the whole dropped off; but as the operation may be both more neatly and more speedily done with a scalpel, it ought in every instance to be preferred. In whatever way it is done, as much

of the skin should be removed as appears to be superfluous. If the edges of the fore, on being brought together, can be retained with adhesive plaster, it ought to be done; but when plasters do not answer, we have recourse to the interrupted future.

SECTION VI.

Of the Gaping or turning Outwards of the Eyelids.

THIS deformity is produced by the internal surface of one or both of the eyelids being turned outwards so as to fold over some part of the cilia and contiguous skin: by nosologists it is in general termed ectropium; and lagophthalmus when in the upper eyelid only, from the resemblance which it is supposed to bear to the eye of a hare.

Every degree of this affection occasions deformity; so that even in this view it merits attention: but in its more advanced stages it frequently gives much distress, by leaving a considerable part of the eye uncovered.

The internal membrane of the eyelids may be turned outwards by various causes: tumors of whatever nature they may be when seated within the orbit, sometimes produce it: it is also induced by dropical effusions in the cellular substance that covers it; and likewise by inflammation of the same part. Relaxation, induced either by an inflamed state of this part, by a previous dropical swelling, or merely as a consequence of old age, excites the most obstinate kind of it: and lastly, we find it often induced by the cicatrix of a wound or abscess, when so situated as to corrugate or contract the skin of either of the eyelids. In the method of cure it is evident, that due attention becomes necessary to the particular cause by which it is produced.

When tumors are discovered to be the cause, they must be removed in the manner pointed out in Sect. IV. of this Chapter. When they appear to be dropical, connected with general anasarca, if the disease of the system is carried off, this particular symptom will most frequently vanish also ; but when it appears to be local, as in some instances is the case, no dependence is to be placed on medicines : in this case, the effused fluid should be discharged either by punctures or scarifications, not made through the external coverings of the eyelids, but directly into that part of the internal membrane that is protruded by the water collected within it. Small punctures should be first advised with the point of a lancet ; and if these fail, scarifications should be made with one or other of the instruments delineated in Plate XII. fig. 4, or in Plate XXIII. fig. 5, all along the course of the swelling ; and being carried to a sufficient depth, they will not only discharge the effused water, but the inflammation which they excite will tend to prevent it from collecting again : after the water is discharged, and any inflammation induced by the operation is gone, the parts should be frequently bathed with a weak solution of white vitriol, or any other astringent collyrium.

In cases of ectropium induced by inflammation, our means of cure should be chiefly directed to the removal of this symptom ; and, for the most part, when not long neglected, or not particularly obstinate, the protrusion will subside on the inflammation being removed. But when the inflammation has subsisted long, the protrusion often continues fixed and permanent long after the cause that gave rise to it is gone : whenever the disease therefore depends upon this cause, we should endeavour by the most active remedies to have it speedily carried off. In Section II. of this Chapter, these have been fully enumerated : I have now therefore only to remark, in addition to the means that were there pointed out, that deep sca-

rifications into the inflamed membrane itself prove here particularly useful. The vessels of the protruded membrane are in this state of the disease commonly so turgid as to give it a considerable degree of preternatural thickness : if this increase of bulk be not removed, no cure can take place ; and nothing tends with such certainty to accomplish this, as unloading the inflamed vessels of their contents ; which we do in the most effectual manner by deep scarifications.

When again, the disease occurs from relaxation, as is often the case in advanced stages of life, no surgical operation should be advised. In this situation we trust altogether to palliatives. The patient should be desired to bathe his eyes daily in cold water, or in water mixed with a small proportion of brandy ; or he may use a weak astringent collyrium of vitriolum album and saccharum saturni dissolved in water. In this manner, he may prevent the disease from advancing farther, and in some instances may even be able to remove it. But whether this should be the case or not, when it is evidently the effect of old age, nothing very severe in its operation should ever be advised.

The most distressful, and perhaps the most frequent cause of ectropium, is the cicatrices of sores, abscesses, and the confluent small pox, when so situated as to contract the skin of either of the eyelids. A cicatrix may be so situated, as we have seen in the last section, as to produce an inversion of the cilia. Of this I have met with different instances, but it more frequently happens, that the disease we are now considering is induced by it.

As the disease is here evidently induced by a preternatural contraction of the skin connected with the eyelid, nothing can accomplish a cure but the division of such parts of the skin as are thus morbidly drawn together. For this purpose, the operator, by an attentive examination of the parts affected, should render himself perfectly certain of the full extent of the disease ; and this being done, an incision should be

made directly across that part of the skin which appears to be contracted, and carried freely into the cellular substance by which the skin is connected to the parts beneath. When the contraction takes place at one point only, a free division of the skin at this part will be sufficient; but it commonly happens, that the skin is fixed to the parts beneath over the whole course of the cicatrix; in which event, a small incision, in the manner I have mentioned, and with which operators in general rest satisfied, will have little or no effect in removing the disease.

In this case, after making an incision through the teguments from one end of the cicatrix to the other, the edge of the divided skin should be raised with the assistance of dissecting forceps, and the whole of it should be separated and removed with the scalpel from the parts to which it adheres. If this is properly done, that part of the eyelid that was turned outwards, will either return of itself to its natural situation, or it may be easily replaced by the operator; and this being done, the rest of the cure must consist in such an application of a bandage, or of slips of adhesive plaster, as will retain the skin, till by the formation of granulations at the bottom of the sore, any farther contraction may be prevented. To give directions for the application of bandages is unnecessary, as it must always depend on the ingenuity of the operator. In general, however, I may remark, that when slips of adhesive plaster can be made to answer the purpose of bandages, they ought to be preferred for parts contiguous to the eyes, where bandages can never be applied with such tightness as to retain the dressings, without injuring the parts beneath.

SECTION VII.

Of Concretion of the Eyelids.

IT has long been known, that any two parts of an animal body being kept in contact when inflamed, very readily unite together ; a fact that accounts for many phenomena, and among others for those adhesions of the eyelids that sometimes succeed to an inflamed state of these parts. Inflammation of the eyelids, when of long duration, frequently forms partial adhesions, not only of the eyelids to each other, but to different parts of the eye itself : to slight degrees of this, a patient will commonly rather submit, than undergo the pain and terror of an operation ; but when the adhesions are so considerable as to impede the motion of the eyelids, and thus to obstruct vision, it becomes necessary to employ the most effectual means for relief. It sometimes happens, too, that the eyelids adhere together at birth, of which I have met with different instances.

When the adhesion is slight, and not of long duration, it may in general be removed by separating those parts of the eyelids that adhere, with the end of a blunt probe passed behind them ; but when they adhere either firmly to each other, or to the eyeball, a cure can be effected by dissection only. In performing this operation, the patient's head should be firmly secured by an assistant, who should likewise endeavour to support or elevate the upper eyelid, whilst the surgeon, with small forceps in one hand, should raise or separate the under palpebra, and at the same time should proceed to divide with a scalpel in the other, every fibre by which the adhesion is produced. In every part of the operation, much steadiness is required ; particularly where any part of the palpebræ adheres to the eyeball.

When the cause of adhesion is thus completely removed, as the dressings usually applied to sores cannot with propriety be used here, all that we should attempt, is to cover the eye with soft lint spread with Goulard's cerate, or any other emollient ointment; and after the first dressing, a small portion of the same ointment, perhaps the size of a pea, may be daily insinuated between the eyelids: by this means the sore is kept soft and easy, at the same time that the usual motion of the eyelids prevents every risk of new adhesions between the parts newly divided. In this, however, as well as in every operation upon the eye, the structure of which is so delicate as to render it very susceptible of inflammation, much attention is necessary to prevent this symptom, and to remove it when it has actually taken place.

SECTION VIII.

Of Fleshy Excrescences on the Cornea.

EYES that have been liable to repeated attacks of inflammation, are apt to have a membranous substance form on some part of the opaque cornea: this, in some instances, continues of a small size, and does not produce much inconvenience, while in others it extends so as to form a ring round the whole tunica conjunctiva, and even spreads to such an extent as to cover not only all the opaque cornea, but even the transparent part of the eye.

Being supposed to resemble a fowl's wing, it has by some been termed pterygium, and by others onyx, from its resemblance to the nail of a finger: it begins most frequently near the internal angle of the eye; but in some we first perceive it on the most prominent part of the tunica albuginea.

In some instances of severe inflammation, a tough yellow coloured membranous substance forms and spreads over the whole eyeball: this, however, is perfectly inorganic, and is evidently of the same nature with those crusts or exudations so frequently met with in parts recently inflamed: but the disease we are now considering consists of an organic membranous substance, that is equally irritable with other parts of the body, and which, when wounded, discharges blood freely. It is indeed so clearly vascular, as to render it probable that it consists entirely of a congeries of small blood vessels, which being once forced out from any point of the ball of the eye, either as a consequence of external violence or of inflammation from any other cause, we can easily suppose that every fresh attack of inflammation will cause them to pullulate or shoot out in a degree somewhat proportioned to the violence of the cause by which it is produced.

In some instances, this production does not appear till the violence of the inflammation is over: in which case, it is not accompanied with pain, unless when some cause of irritation is applied to it; but in others it takes place during the continuance of inflammation, when the pain attending it is always severe. During this inflammatory state of the disease, this membrane is in general of a deep red colour; but when the inflammation subsides, it becomes pale and somewhat yellow.

As long as this kind of excrescence continues of a moderate size, and does not impede the motion of the eyelids, nor obstruct vision, all we ought to do is, by means of gentle astringents, to endeavour to prevent its increase. In Section II. of this Chapter, I have said all that appears to be necessary on the subject of inflammation. I shall now therefore suppose that the inflammatory symptoms are, by the means which were then pointed out, either removed or much mitigated, and that our attention is now to be directed to the removal of this preternatural membranous pro-

duction. In this state of the disease, astringent applications, as I have observed above, ought to be alone depended on as long as the size of the excrescence is inconsiderable. A weak solution of corrosive sublimate, in the proportion of a grain to four ounces of water, has sometimes proved useful; but in general, nothing answers either with such certainty or safety as white vitriol, or alum, dissolved in water, care being taken to have the solution of such a strength as the eye can easily bear. A scruple of white vitriol, or half a drachm of alum, to four ounces of water, will in general prove sufficiently strong: but in every case, the strength of the remedy ought to depend on the feelings of the patient; for with some it may be employed of double the strength which others can bear.

A proper use of escharotic powders has also proved useful here; but in this form, escharotics require to be used with much caution. Calcined alum in fine powder, a small proportion of white vitriol, or of verdigris, mixed with a sufficient quantity of white sugar, or any other powder of a mild nature, may all be used for this purpose. A small quantity of any of these may be sprinkled upon the diseased part once or twice daily, and repeated as long as any benefit is derived from them; or the use of the powders may be alternated with that of the wash in the manner I have mentioned.

A due perseverance in the use of these remedies will very commonly retard, as I have observed above, the progress of the excrescence; but when it proves otherwise, and when it proceeds so far as to cover any part of the transparent cornea, as this might soon be attended with a total loss of sight, other means should be employed.

As our object here is to remove the excrescence entirely, the scalpel alone is to be trusted. Authors, who have written on this subject, describe an operation for the purpose of removing membranes of this kind by dissection. When the excrescence is loose through

a considerable part of its extent, and attached to the eye by a small pedicle only, it may be removed with safety and expedition with a scalpel ; and in such cases, this method should be preferred to every other. But whenever it adheres to the eye over its whole surface, to remove it by dissection is both difficult and hazardous ; and as the same intention may be carried into effect by more gentle means, these ought to be adopted.

This excrescence is very commonly seated, as I have already observed, upon some part of the tunica conjunctiva, and approaches in a gradual manner towards the centre of the eye : we have likewise seen that it consists almost entirely of an extension or elongation of a number of small blood vessels : hence we may conclude, that nothing will tend with more certainty to remove it, than the destruction or division of those vessels by which it is produced : and accordingly I have in various instances been able to complete the cure of such affections by these means alone ; and as the operation for this purpose, with those accustomed to perform it, is neither attended with difficulty nor danger, it ought always to be done as soon as the disease is found to resist the means usually employed for it.

The method of performing it is this : the patient being placed upon a pillow on the floor, the surgeon, sitting behind on a chair, should cause him to incline his head backwards upon his knees, with his face raised in such a manner that a sufficient degree of light may fall directly upon his eyes. This being done, and the patient's hands properly secured, the under eyelid should be drawn down by an assistant, while the upper palpebra is supported in such a manner by the left hand of the surgeon, as to expose to view the full extent of the disease on the eyeball. With the knife, fig. 4. Plate XII. he is now to make scarifications through the full thickness of the excrescence, near to, and entirely round, its external circumference, so as to cut off all communication between the roots and

extremities of those vessels of which it is formed. This may either be done by one continued stroke of the scalpel, or with repeated smaller scarifications; and in order to render the success of the operation more certain, by a free division being made of every blood vessel connected with the excrescence, after the discharge of blood induced by the first incisions is abated, one, two, or more circular scarifications may be made within one another, in such a manner as that the last may be contiguous to the centre of the excrescence.

In making these scarifications, it is necessary to avoid the eyeball; for which reason, it is better to do the incisions by repeated strokes, than to go to the full depth of the excrescence at once; but it may be done with much more ease in the manner I have mentioned, than by lifting the excrescence with a needle and ligature before dividing it; for we may just as readily injure the coats of the eye with the needle as with a scalpel. This method of elevating the parts to be divided by means of a ligature, is much recommended by some practitioners; but I know from experience, that the operation may be performed with more ease in the manner I have pointed out.

After as many incisions have been made as appear to be necessary, the parts may be allowed to bleed freely, and may be afterwards bathed two or three times daily with a weak solution of *saccharum saturni*. The incisions may also be repeated in a similar manner, if, in the course of a few days, the excrescence does not begin to diminish; and the same operation may be renewed with safety from time to time, as long as any part of the disease is found to remain.

When, again, any portion of the excrescence is observed to become more loose in its connection with the eye, either in consequence of the number of incisions made in it, or of the suppuration which commonly ensues from this operation, it ought immediately to be removed with the scalpel: but when this does not happen, and when every part of it continues

still to adhere firmly to the eye, no attempt should be made to remove it.

When a cure can be effected by any means hitherto known, the plan that I have mentioned will more readily answer than any other; and being attended with no hazard to the eye, it ought to be preferred. But it is necessary to remark, that although this operation very commonly succeeds, yet instances sometimes occur, in which no advantage is derived from it, and in which scarifications made in the excrescence, or any other operation performed on it, instead of proving useful, is regularly attended with an increase of the disease. This being the case, the operation I have described should not be persisted in. In such circumstances, a palliative course ought alone to be kept in view. No remedy with which we are acquainted, will in this state remove the disease, but it may commonly be prevented from acquiring any additional increase; and the symptoms induced by it may be kept moderate, by the eye being frequently bathed with a weak saturnine solution, and by keeping it covered with pledgets of Goulard's cerate, or any other similar application.

When it is found, however, that the disease does not yield to any of the remedies I have mentioned, and if the excrescence still proceeds to acquire an additional bulk; so as entirely to destroy vision, and to excite severe pain, as this will give much cause to suspect that it may degenerate into cancer, it ought at once to be removed by extirpating the eyeball. The remedy is no doubt severe: but in circumstances such as we are describing, as the use of the eye is supposed to be irrecoverably lost; and as the patient's life might be endangered by the contiguous sound parts being allowed to remain long in contact with those that are diseased; no doubt should be entertained of the propriety of removing them. The method of performing this operation will be the subject of one of the following sections.

SECTION IX.

Of Abscesses in the Globe of the Eye.

INFLAMMATION of the eyes is by experience known to terminate most frequently by resolution ; that is, the pain and tension abate, and the redness and fulness of the vessels are dissipated, without any marks being left of their having ever existed. Instances, however, occur of inflammation of the eye ending in the formation of matter ; in some cases, from those means being omitted at first which most certainly tend to remove inflammation ; and in others, from the patient being of a scrofulous habit or otherwise diseased.

When the internal surface of the coat of the eye has been long inflamed, it sometimes yields a purulent like matter, which being poured into one or other of the chambers of the eye, is soon diffused over all the aqueous humour ; by which the ball of the eye not only becomes enlarged, but vision is either in a great measure or perhaps entirely destroyed ; the appearance of the eye is much changed ; and neither the iris, pupil or crystalline, can be distinguished.

In some instances again, the iris is pushed forward, and is observed to lie in close contact with the internal surface of the transparent cornea : the coats of the eye being weaker here than in other parts, a protrusion commonly takes place, which, if not soon opened, at last bursts of itself, and discharges either some part or perhaps the whole contents of the eye ; and at this opening, the iris, in a thickened diseased state, is very generally pushed out. It is this disease which, from its supposed resemblance to a grape, is denominated staphyloma ; different varieties of which are described by authors under different names : but, as these are all of a similar nature, and require the same meth-

od of treatment, any difference or form from whence these denominations have been taken, is not of such importance as to deserve notice; and as the distinctions they hold forth, answer no good purpose, I do not mean to enumerate them.

Under the general term of staphyloma, a word I shall retain merely from its having been long employed, may be comprehended all collections, such as I have described, that take place within the cavity of the eye. In most instances, as I have already observed, the transparent cornea is protruded from its being the weakest part of the eye; but in others, partial swellings or protrusions occur in the sclerotica, or opaque cornea.

During the formation of this disease, the patient suffers not only loss of sight, but severe pains in the eye, that shoot backwards through the head, attended with want of rest, heat, and other symptoms of fever; and these very commonly remain either till the eye bursts of itself, or till its contents are discharged by an opening made for the purpose.

In most instances, the pain is severe, but I have met with cases in which no other inconvenience was experienced but deformity and loss of sight; but in these, any matter that forms in the swelling is in small quantity, and the principal part of the tumor appears to be produced by serum; and in some instances perhaps by an increased secretion of the aqueous humour of the eye; but, whether it contains a greater or smaller proportion of pus, the external appearances are the same, and the method of treatment is likewise similar.

Besides the collections I have described, in which the matter is lodged within the coats of the eye, this organ, we find, is liable to abscesses of a different nature, in which the matter is seated in the substance of one or other of its tunics. In the small pox, it sometimes happens, that a pustule is seated on the eyeball, when the variolous matter being formed between two of its coats, gives all the appearances of a small abscess;

but collections of pus also occur here from external injuries; and from inflammation, by whatever cause it may be induced; although by no means so frequently, as I have already remarked, as in other parts of the body.

This disease has, in general been termed hypopion. It ought not, however, to be distinguished by any particular appellation; for, it is precisely an abscess in the coats of the eye, and exhibits exactly the same appearances here, and requires to be treated in the same manner, as collections of matter in any other part.

The matter in this disease is met with in various parts of the eye; in some instances in the sclerotica; but most frequently in the transparent cornea, when it very commonly destroys vision entirely.

The hypopion is distinguished from the staphyloma by the matter being collected in a particular bag or cyst; at least it is always confined to one part of the eye, which is observed to be elevated into the form of an ordinary abscess, whilst the rest of the eye retains its usual form: but in the other, although the matter always at last forces out some protuberance; most frequently, as I have already observed, in the transparent cornea; yet an enlargement may be commonly observed over the whole substance of the eyeball: in both, the motion of the eyelids is much impeded; but, in the staphyloma, this is always more considerable and more distressful than in the other, and in it also a sense of tightness is felt over the whole globe of the eye; whereas, in the hypopion, this uneasiness occurs at a particular point only. In the latter, the pain is seldom so severe as when the matter is collected within the ball of the eye. Any uneasiness produced by it, affects the surface of the eye only, and does not spread back towards the head as it commonly does in the staphyloma.

In the treatment of the staphyloma, as it rarely happens that the use of the eye can be preserved, our great object should be to abate the violence of the

pain, and remove that deformity which an enlargement of the eye is always sure to produce. With a view to abate the pain, bloodletting, blisters, cooling applications to the eye, and opiates, are to be chiefly depended on at first : in this stage of the disease, indeed, the pain is to be considered entirely as the effect of inflammation, and to be accordingly treated in the manner I have pointed out in Section II. of this Chapter.

But when these and the other means employed for abating inflammation do not succeed ; if suppuration takes place ; and if the pain still continues severe, as this very commonly occurs from the coats of the eye being distended ; nothing will so certainly give relief, as discharging the matter by making an incision into the ball of the eye. This will commonly indeed evacuate all the humours of the eye, particularly the aqueous humour ; but in circumstances such as we are describing, this is not to be regarded, as vision is already totally destroyed by the disease. We are therefore to use the most effectual means for removing pain, and for obviating the deformity induced by the enlargement of the eye, without any regard to the humours which it contains. For this purpose, an opening should be made in the eye sufficiently large for discharging all the thinner part of its contents, the best situation for which is the most depending part of the tumor. The patient's head being secured by an assistant, and the operator standing before him, the eyelids may be sufficiently separated with the fingers of one hand, while the point of the knife, figure 4, Plate XII. being introduced with the other into the part to be opened, it may be easily carried forward in a horizontal direction, till an opening is made of a size sufficient for the purpose.

Authors who have written upon this subject, instead of a simple incision into the tumor, direct all the prominent part of the eye to be cut off either with a scalpel or scissars : whilst others, from an apprehen-

sion of hemorrhagies from an extensive wound, have advised the tumor to be removed with a ligature ; by which they imagine that the eye may be sufficiently diminished, at the same time that the deformity produced by the swelling will be effectually removed. There is no necessity, however, for our adopting either of these methods ; which are both of them more painful, and neither of them in any respect more useful than the mode I have advised, of discharging the contents of the tumor by a simple incision. The disease, as I have already observed, is in reality an abscess, or a collection of matter within the coats of the eyes ; and ought to be treated exactly in a similar manner with abscesses in other parts of the body ; not by removing any part of the tumor, but merely by laying it open. There is indeed a variety of the staphyloma sometimes met with, in which, either from a long continuance of the disease, or from some cause with which we are not acquainted, the different humours of the eye are totally absorbed, or as it were annihilated, and in which all the external appearances of the disease that have just been described, are distinctly observed ; but in which the tumor is formed by a thickening of the different coats of the eye, and particularly of the iris. In this situation, no benefit could ensue from this operation ; nor from any other means, but the extirpation of all the prominent part of the eye ; which is best done with a scalpel. It rarely happens, however, except in the very advanced stages of the disease, that this variety of staphyloma is met with.

After the contents of the eye have been discharged, the parts should be slightly covered with a soft compress, moistened with a weak saturnine solution ; the patient should be kept upon low diet ; and every part of an antiphlogistic regimen should be pursued, either till the wound in the eye is completely cured, or till there appears to be no risk of inflammation.

With respect to the cure of hypopion, namely, that species of the disease in which matter is collected either in the substance of one of the coats, or between two of the coats of the eye, it should be nearly the same with what I have advised for staphyloma. In general, the pain is moderate, or is easily kept so with small doses of opiates; and as soon as the matter is freely and clearly formed, it should be discharged by an incision made in the manner I have mentioned, in the most depending part of the abscess.

The general practice on this point ought not however to be followed. We commonly observe that practitioners decline to operate, till they are in some measure forced to it, either by the deformity being considerable, or by the abscess becoming so large as to impede the motion of the eyelids. But delays should be always avoided when it is obvious that suppuration has taken place; for as the matter of the abscess may just as readily burst inwardly, and mix with the humours of the eye, as outwardly by an external opening; and as this very constantly terminates in a total loss of vision, it ought in every instance to be guarded against, by discharging the matter as soon as it is certain that suppuration has taken place. The after treatment of the parts should be the same here as in cases of staphyloma.

In both these diseases, fungous excrescences are apt to form where the opening has been made; but this we may commonly prevent or remove by the application of calcined alum in fine powder, or touching the parts from time to time with lunar caustic, a practice from which I have never known any hazard ensue.

SECTION X.

Of dropfical Swellings of the Eyeball.

IN dropfical fwellings of the eye, the patient complains of a sense of fulness in the eyeball, long before any increase is perceived in it by others : at last the motion of the eyelids begins to be impeded ; and although the power of vision still in some degree continues, yet it gradually becomes more imperfect, till at last the patient can scarcely distinguish light from darkness. In this period of the disease, some part of the eye, most frequently the transparent cornea, generally begins to protrude, so as to form a small tumor, and if the contents of the eye are not now discharged by an operation, the swelling in this state commonly proceeds to increase quickly, and soon bursts of itself.

When the disease has been of long duration, it is apt to be mistaken for staphyloma, to which indeed it bears a resemblance ; but, in the real dropfical swelling, the patient is always sensible to the effects of light ; and if the pupil can be distinguished, a clear light will commonly make it contract. Whereas, in the other, excepting in its very first stages, the patient is never sensible to light, nor can any kind of contraction be discovered in the pupil. When these diseases, however, are far advanced, our being able to distinguish them could be of little importance, as in this situation the use of the eye is in general so much destroyed as not to be recoverable : but in the commencement of this affection, we may very commonly distinguish it from the other ; and when we are able to do so, it ought not to be neglected.

Staphyloma is evidently an inflammatory disease : it begins with all the symptoms of inflammation, and terminates in the formation of pus. By this circumstance alone it is very distinctly marked ; so that, in

the early period of the disease, it is easily distinguished from a mere dropfy of the eye; in which no symptoms of inflammation take place, and in which the only marks of disease at first are, a sensation of fulness in the eye, which by degrees terminates in an enlargement of the eyeball, and in a confused state of vision.

When, by a long continuance of the disease, vision is destroyed, all that we have in our power to do, is to remove the deformity arising from the enlargement of the eyeball; which is most effectually done by an incision made in the most prominent part of the tumor, in the manner that I have mentioned in the last section. But in the earlier stages of this tumor, an object of greater importance presents itself, I mean the possibility of saving the use of the eye; which, from the result of some cases that I have met with, there is reason, I think, to imagine might in many instances be done.

When water or any other fluid collects in the eye in such quantities as to enlarge it much beyond its natural size, vision is thus frequently destroyed merely by distention, when no other morbid affection is perceived. In such circumstances, when the nature of the disease is obvious, and as soon as the eye begins to lose its usual powers, instead of allowing the swelling to increase, as is commonly done, till it arrives at a great bulk, and till the power of vision is lost; would it not be better to discharge the fluid by which the swelling is produced? No danger could result from it, for the operation may be done with safety; and it would at least prevent the eye from suffering by over distention, and might thus give some chance of a cure being obtained, either as an effort of nature, or by the application of proper remedies.

The easiest and best method of performing this operation, is by making a small opening in the under and most depending part of the transparent cornea. By passing the point of the knife, fig. 4. Plate XII. into this part of the cornea, and making an incision

of three-tenths of an inch or thereby in length, all the aqueous humour is at once discharged, and as the wound seldom heals immediately, the water or serum is thus allowed to drain off almost as quickly as it is secreted. But in the event of the disease returning after the wound in the cornea is healed, as a repetition of the operation in this part might induce a cicatrix of such a size as would injure vision, I should think it better to make an opening into the posterior chamber of the eye, directly behind the iris, either with the point of the knife above mentioned, or with a very small trocar. This instrument, if not thicker than a crow's quill, and made of a flat or lancet point form, will penetrate the coats of the eye with almost as much ease as a round couching needle; and an opening made with it will discharge the aqueous humour of the eye with more certainty than an opening of an equal size made in any other manner.

The patient's head being properly supported by an assistant, the eyelids may be sufficiently separated by the operator himself, with the fingers of one hand, whilst, with the other, the trocar is pushed into the most depending part of the eye: the point of the instrument should enter at a tenth part of an inch behind the iris, and be carried to such a depth, that the end of the canula may be completely covered by the coats of the eye, when the stilette should be withdrawn; and as much of the aqueous humour being allowed to run off, as is judged proper, the canula may be taken out, when the opening will require no further attention. With a view, however, to strengthen the eye, and, if possible, to prevent a return of the disease, the parts may be frequently bathed with an astringent wash; such as cold water with a proportion of brandy, a solution of alum, or a decoction of oak bark. In this manner a complete removal of the disease may in some instances be obtained; and as it gives at least some chance of preserving the eye, I do

not hesitate to recommend it in preference to the usual practice of allowing the tumor to become so large before being opened, as to produce in almost every instance an entire loss of the organ.

When the tumor has become so large as to destroy vision entirely, it has been proposed to discharge the contents of it, by passing a small seton or cord through the eye: but in an organ of such delicate mechanism, whose parts are all extremely irritable, there is reason to imagine that more pain and inflammation would in general ensue from this, than from a free incision made with a knife, or with a lancet; and as the full intention of the operation may be obtained by this means, it should therefore, I think, be preferred.

SECTION XI.

Of Blood effused in the Cavity of the Eyeball.

A FREE passage of the rays of light to the optic nerve, so necessary for a perfect state of vision, requires a clear and transparent state of the different humours of the eye. We find accordingly, that vision is always greatly impaired, in many instances even destroyed, by any of the humours becoming opaque, and nothing tends more certainly to induce opacity of the aqueous humour than blood being effused in it.

Blood may be effused in the aqueous humour of the eye, by various causes. In some instances it has been the effect of putrid diseases, either producing a dissolved state of the blood; or arising more probably from a relaxed state of the solids, by which the red globules of the blood are admitted into vessels and parts which do not naturally receive them, and by which all the secretions are in these diseases frequently tinged with blood. Blood is sometimes poured into the eye, too, as the effect of an inflamed state of this or-

gan ; but we meet with it more frequently, as the consequence of a ruptured blood vessel from external violence, than from any other cause. It frequently ensues from blows on the eye, and from wounds that penetrate the posterior chamber. In some instances, too, wounds that penetrate the anterior chamber only are succeeded by effusions of blood ; but this is not frequent, as the vessels of this part of the eye are in general so small that they do not admit red blood.

In whatever manner blood may be effused in the eye, if it mixes with the aqueous humour, so as to render it opaque, and is not soon absorbed, it ought to be discharged by an operation. In a few cases, we observe, that a small quantity of blood is effused in the eye, without exciting any inconvenience, by its sinking immediately below the axis of vision, and remaining in this situation without mixing with the aqueous humour. In this case, no attempt should be made for removing it ; for, as long as it continues at the bottom of the eye, no harm is done by it ; and we have it always in our power to remove it, if, at any period in future, it is found to dissolve in such a manner in the aqueous humour as to render it opaque, or materially to injure vision. The method of performing this operation should be the same with that which I have pointed out in the last section, for the removal of dropsy of the eye.

The opening should be about three-tenths of an inch in length, and be made as near to the most depending part of the transparent cornea as the junction of the iris to the coats of the eye will permit : in order to promote the discharge of the blood, the patient should be desired to turn his face downwards, and the sides of the divided cornea may be somewhat separated by the end of a blunt probe. As the aqueous humour will be discharged along with the blood, the eye will appear to be much diminished by the anterior part of it collapsing. This, however, is a matter of

little importance ; for the wound in the cornea commonly heals soon, and the aqueous humour is in general quickly renewed. The only application required after the operation, is a compress of soft lint moistened in a weak solution of saccharum saturni.

SECTION XII.

Of Ulcers on the Globe of the Eye.

IN Chapter IV. the theory and management of ulcers were fully considered ; so that I shall refer to what I there endeavoured to establish : but ulcers on the eye merit particular attention ; for we have here not only the cure of the ulcers to keep in view, but means must be employed to prevent or remove those marks or spots which they almost universally produce, and which very commonly terminate either in a total or partial loss of sight. In other parts of the body, the cicatrix induced by an ulcer is seldom productive of much inconvenience ; but in the eye, the cicatrix of even the smallest sore does much harm. It is evident, however, that this effect of ulcers must depend much on the part of the eye on which they are seated. Thus, we observe, that even large ulcers form on the tunica conjunctiva without vision being injured ; whilst they commonly destroy it entirely when seated on the transparent cornea : our prognosis therefore, must in general, in a great measure, depend on their situation ; for sores, which in one part of the eye might be of little importance, will in others render the organ useless.

The danger arising from ulcers on the eye, depends in some measure, too, upon their form, which we find to be equally various here as in other parts of the body ; but the structure of the eye renders the form of any sore that occurs in it of more importance

than it can possibly be in any other situation. In some instances, ulcers upon the eye are very superficial, being no deeper than the tunica adnata ; whilst in others they are small, narrow, and penetrate to a considerable depth. Those which spread upon the surface of the eye may destroy vision by the cicatrix which they produce ; but the deep seated ulcers are not only attended with this effect, but very commonly terminate in an evacuation of the aqueous humour, either from their penetrating immediately through all the coats of the eye, or from their leaving such a weakness in some particular part, as admits of the aqueous and other humours forcing a passage for themselves.

In other cases again, instead of a loss of substance being produced by ulcers, the parts become soft and fungous, and excrescences or granulations shoot out, as we frequently find to be the case in fores of other parts of the body.

Ulcers of the eye may arise from various causes ; such as wounds, contusions, and burns. And they may be induced by a general disease of the constitution ; such as lues venerea, and scrofula. But in most instances they may be traced as the effect of inflammation terminating in suppuration ; for abscesses in the eye are often met with ; and every abscess terminates in an ulcer, excepting in a very few instances ; in which they either continue during life, or in which the matter, instead of being discharged by an opening, is absorbed into the system.

Ulcers of the eye are not only often induced by inflammation, but it commonly happens, that inflammation is the most troublesome symptom with which they are attended : indeed the pain arising from an inflamed state of an ulcer on the eye, proves in some instances so very distressful, as to induce restlessness, heat, quickness of pulse, and every other symptom of fever : so that in the treatment of these ulcers, this symptom of inflammation requires our most serious attention.

When they are found therefore to be in an inflamed state, bloodletting, both general and local, should be employed ; together with blisters, laxatives, and cooling applications to the eye, in the manner pointed out in Section II. of this Chapter, for the cure of ophthalmia : for till the violence of this symptom abates, no remedy we can employ for the cure of the ulcers will answer the purpose : in other cases of ophthalmia, along with general evacuations, I have urged, in a particular manner, the propriety of local bloodletting, by scarifying the turgid vessels of the eye. In ulcers of the eye, too, where enlarged vessels are observed to pass from the fores over a considerable part of the eyeball, it often proves useful to cut these vessels completely across ; not only for the removal of inflammation, but for the cure of the ulcers. From observing the effects indeed that result from this, I think it probable, that the discharge arising from ulcers of the eye is commonly supplied by the turgid vessels that run into them ; for it often happens, that the fores are cured by this remedy alone, when every other means have failed. The operation, however, requires to be very neatly and steadily performed ; for when deep and extensive scarifications are made in the neighbourhood of an ulcer, they are apt to degenerate into tedious sores of a similar nature. This, however, is not the fault of the remedy, but of the method of putting it in practice : for it is an effect I have never observed to result from it, when the turgid vessels only have been divided ; which may be easily done in the manner I have mentioned in Section II. of this Chapter.

Some have objected to this practice, that by dividing the lymphatics, which proceed from the fores along with the turgid blood vessels, the healing of the fores will be rendered more tedious than it otherwise would be ; for these, by absorbing the matter secreted or discharged into ulcers, they conclude must have a considerable influence on the cure : and therefore, it is said, that we should not run the risk of dividing them,

by scarifying the large vessels of the eye, which they very commonly accompany. The idea is ingenious ; but so far as I have observed, it is not supported by experience. Scarifications, when improperly performed, may in some instances, as I have observed above, do harm ; but in many cases of ulcers of the eye, I have known them prove very useful. Besides, we might, from reasoning alone, conclude, that scarification, when properly performed, ought not to do harm ; and that the doubts which have been entertained with respect to it, cannot be well founded : for although some proportion of the matter afforded by ulcers is no doubt carried off by absorption, yet daily experience shows, that we are never to depend upon this for effecting a cure ; and, on the contrary, that sores are more frequently cured by applications, that seem to act by destroying the power of the absorbents, as well as of the other vessels with which ulcers are supplied, than by any other means ; namely, by drying astringent remedies, and by external pressure, applied with such firmness as must frequently annihilate the smaller vessels of sores, by keeping them for a considerable time closely compressed together.

After the inflammatory state of an ulcer on the eye has been removed in the manner I have mentioned, our views should be exactly the same as in the treatment of sores in other parts of the body ; and the means employed for effecting them, must, for the most part, be likewise similar. When it appears to be connected with any general disease of the system, this must be corrected before any permanent cure can take place. In some instances, sores on the eye are combined with lues venerea ; in which case a well directed mercurial course is alone to be trusted to : but they are much more frequently combined with scrofula ; a disease which often affects the eyes more than any other part of the body ; and hitherto we have not been so fortunate as to discover any certain remedy for its removal. Cold bathing, however, with the use of muriated ba-

rytes, steel mineral waters, bark and other tonics, and living in a dry atmosphere, frequently prove useful; and for the symptom that we are now considering, namely, ulcers on the eyes, issues, when duly persisted in, are to be more depended on than any remedy with which we are acquainted.

In the local treatment of sores upon the eye, the remedies to be employed must depend entirely on the appearances which take place. Before any attempt is made to induce the formation of a cicatrix, any fungous excrescences which occur must be destroyed; and if the matter discharged is thin, and the bottom of the ulcer foul, these circumstances must be corrected. With this view, detergent ointments and washes, as they are called, should be applied; and for the removal of excrescences, the scalpel and escharotics are alone to be depended on.

A general prejudice prevails against the use of stimulating applications to the eye; and in many of the diseases to which this organ is liable, they certainly cannot be employed with propriety; but in others, especially in ulcers, they may not only be applied with safety, but with much advantage: in many instances a cure cannot be otherwise obtained, and much mischief is daily done by the contrary practice of a long continued use of emollients. In cases of ophthalmia, accompanied with much pain and tension, a proper use of emollients, particularly of warm fomentations and cataplasms, proves in some instances extremely useful; but in ulcers of the eye, after the inflammation is removed, instead of being productive of any advantage, I have constantly observed them do harm. They not only seem to promote that tendency to relaxation and sponginess which usually occurs in these sores, but in different instances they have appeared to be the sole cause of those excrescences very frequently met with in ulcers of the eye, and which always prove extremely troublesome. When I first engaged in practice, I entered into a free use of remedies of this class, in ul-

cers as well as in other affections of the eyes ; but I now think it fair to acknowledge, from repeated instances of their proving hurtful, that I am convinced that they should be employed with caution.

When the ulcers are hollow, with foul edges, and discharge thin and perhaps fetid matter, a liniment of wax and oil, with a small proportion of red precipitate, commonly answers the purpose of cleansing them ; or the same intention may be obtained from a remedy of the same nature, prepared with white vitriol, or with a small proportion of verdigris ; care being taken to have the liniment of such a thin consistence, that with a small brush or pencil a little of it may be easily applied at any time over the surface of the sores. By adding a small proportion, too, of camphire to these ointments, their effects in cleansing ulcers of the eye are frequently improved ; and the same remedy proves sometimes useful in a dissolved state, when employed as a wash to the sores. The most effectual wash, however, for this purpose, is either a weak solution of verdigris or white vitriol in water ; and I have in some instances employed, with advantage, a weak solution of corrosive sublimate. One grain of corrosive mercury in four ounces of water, makes a solution of a sufficient strength for this purpose.

Practitioners not accustomed to the application of irritating substances to the eye, may be surprised to find red precipitate, verdigris, and even corrosive sublimate, recommended ; but daily experience shews, that in many diseases of this organ, they may be employed both with freedom and utility.

When by a due continuation of these means, or of remedies of a similar nature, an ulcer on the eye is properly cleansed, and a good suppuration induced, granulations will soon be observed to form ; any deficiency of parts which may have been induced by the sore will be filled up ; and, if no interruption occurs to the cure, a cicatrix will soon be obtained.

It often happens, however, in this state of the ulcer, that a cure is difficult to accomplish. The surface of the sore remains soft, and becomes somewhat elevated above the rest of the eye, by which a cicatrix is prevented. In this situation, drying astringent applications prove most useful. The parts affected should be covered once or twice daily with lapis calaminaris finely levigated; with prepared chalk, or crabs eyes; and they may be bathed morning and evening with a strong solution of alum; with brandy properly diluted; or with a strong infusion of galls or oak bark: by these means, when the constitution is otherwise healthy, a cure will in general be obtained.

When, again, the sore, instead of being hollow and attended with a destruction of some of the parts in which it is seated, is found to be covered with a fungous production, this excrescence must be removed before any permanent cure can be obtained; and the same means must be employed for the purpose here, that prove most effectual for the removal of excrescences in other parts of the body.

In some instances, these productions arrive at a considerable size, and, after separating the eyelids, fall down upon the upper part of the cheek. Of this, different cases are recorded by authors; some of which were on dissection found to be connected with the more interior parts of the eye, and in which extirpation of the eye might have saved the patient: but it sometimes happens, that tumors of this kind adhere to the surface of the opaque cornea only, when they may commonly be removed without any material injury being done to the eye. In general, we are directed to remove these excrescences with ligatures; but as this commonly proves painful, tedious, and uncertain, the scalpel or lunar caustic ought in every instance to be preferred.

For the removal of a large excrescence, excision by the scalpel should alone be trusted; and when done with caution, no danger ensues from it. The patient

being firmly seated opposite to a clear light, and the surgeon sitting before him, his head should be supported by an assistant behind, who at the same time should separate the eyelids, by elevating the one and drawing down the other; which may be easily done by the fingers of each hand properly placed on them. This being done, a needle armed with a firm waxed ligature should be passed through the centre of the excrescence, for the purpose of fixing it and raising it as much as possible from the surface of the eye: with one hand the operator should now lay hold of this ligature, while with a scalpel in the other he slowly and steadily removes the excrescence. The only dressing that should be applied, is a piece of soft lint soaked in a weak solution of saccharum saturni, laid over the eyelid; and if the sore produced by the operation does not heal easily, some of those astringent applications should be employed that I have just had occasion to mention.

But in the treatment of excrescences of the eye which are neither pendulous nor much elevated, there is no necessity for the use of the scalpel, as they may almost always be removed by a proper application of caustic. By touching the surface of the part intended to be destroyed with a piece of lunar caustic, either daily or once in two days, the protuberance will soon be removed; and the sore being in this manner reduced to the level of the rest of the eye, a cure may be obtained by the means I have already mentioned.

It is necessary, however, to remark, that in the application of caustic to the eye, much steadiness and nicety is required; but with due attention it may be done with perfect safety, and often with much advantage. In order to prevent the rest of the eye from suffering by coming in contact with the caustic, the eye should be previously fixed with a speculum; and after the excrescence is rubbed over with caustic, before removing the speculum it should be entirely washed off with a small brush or pencil soaked in warm water; or in warm milk, which proves commonly more

effectual than any other liquid for destroying the activity of caustic. In this manner, all the advantages may be obtained from the use of lunar caustic that we daily derive from it in the removal of excrescences in other parts of the body ; and when applied with caution, it may be done without risk.

I have already remarked, that when the constitution is sound, ulcers of the eye will commonly heal by the means that I have mentioned ; but it happens in some instances that they still continue obstinate, and even daily become more virulent, notwithstanding the use of these and all the other remedies that are employed : in which event, whenever the disease has advanced so far as to destroy vision, and when it is still proceeding to increase, as nothing but extirpation of the morbid parts will afford any chance of preventing it from spreading to the contiguous sound parts, this ought certainly to be advised. The method of extirpating a diseased eye will be the subject of a different section.

SECTION XIII.

Of Specks or Films upon the Eyes.

VISION is frequently destroyed or impaired by opaque spots or films forming upon the eye ; a disease commonly termed leucoma, albugo, or nebula.

These spots are met with occasionally on the sclerotic or white part of the eye ; but, as the inconvenience that ensues from them in this situation is seldom of much importance, they do not often become the object of surgery : but in the transparent part of the eye, they require very serious attention ; for in this situation, even the least degree of opacity is apt to terminate in the entire loss of vision : and although we cannot in every instance remove them entirely, yet

we can often do so, and, by proper treatment, we have it frequently in our power to preserve eyes which otherwise would in all probability be lost.

I have already given a description of various affections that may tend to obstruct vision, by inducing an opaque state of the transparent cornea and humours of the eye. Thus, every high degree of inflammation, the staphyloma, hypopion, and ulcers on the transparent part of the eye, are all attended with this effect: but as each of these forms a distinct disease, requiring a method of treatment peculiar to itself, I have judged it proper to allot a separate section for each of them; and, what I now mean to consider, are those white opaque spots frequently met with on the cornea, which occur most commonly as the consequence of inflammation.

Affections of this kind are for the most part, indeed, so evidently induced by inflammation, that it may be doubted if they ever occur from any other cause; for all those specks which succeed to wounds of the cornea, as likewise those which arise from small pox and measles, are always preceded by an inflamed state of the eye: I therefore conclude, that they depend, perhaps entirely, on inflammation, by whatever cause this may at first be excited.

In attending to the nature of these opaque spots on the cornea, it appears sufficiently obvious, that in most instances they are the effect of that effusion, which inflammation, when in a high degree, always excites. In some cases, when it terminates in complete suppuration, a small abscess is produced; which, either on bursting, or on being opened in the manner directed in a preceding section, very commonly leaves an opaque spot, attended with some degree of prominence or elevation of the parts in which it is seated: but in others, when the effusion, instead of being near to the surface of the cornea, is diffused among the different lamellæ of which this coat of the eye is composed; or when the degree of inflammation which

takes place is not sufficient for carrying it on to suppuration, the opacity induced by it does not, as in the case of an abscess, form a protuberance; but appears rather to constitute a part of the substance of the cornea itself. In the one, the different lamellæ of the cornea are evidently separated from each other; and on the matter contained between them being discharged, the speck which remains appears in the form of an adventitious body, adhering to, but not intimately connected with, that part of the eye on which it is seated: whereas in the other, that is, when a small effusion only has taken place, and when no tendency to suppuration occurs, although a very considerable degree of opacity may be produced by it, yet the nicest examination will not discover the cornea to be at this part either elevated or increased in thickness. In this case, the disease appears to form a part of the eye itself, and cannot be separated from it but with the destruction of the organ; whereas, in the other, the appearances which it exhibits are such as would lead one to consider it as a preternatural formation; and in many instances it may be removed without much injury being done to the eye.

These spots upon the eye are met with in various forms and in different degrees of magnitude; but the inconvenience which they induce is always in proportion to their extent, to their degrees of opacity, or to their situation with respect to the pupil; for as they prove hurtful merely by preventing the rays of light from passing to the bottom of the eye, it is evident that it is by one or other of these circumstances that this must be determined. When a spot upon the eye, therefore, is either so small, so slightly opaque, or so far removed from the pupil, as not to injure vision, it ought not to be considered as an object of surgery; for till the use of the eye is impaired by it, as it is never attended with pain, unless when the parts are inflamed, no other consideration can render it proper to meddle with it: for every practitioner knows, that

this organ is so very delicate, as often to suffer more by the means employed for removing diseases, than it previously did by the diseases themselves. But whenever vision is materially impaired, we are then authorized to endeavour to remove the cause by those means which experience has shewn to prove most fit for the purpose.

I have endeavoured to shew that inflammation is to be considered as the principal and perhaps the only cause of specks upon the eye: this should therefore be a powerful argument, in every instance of inflammation of the eye, for losing no time in the application of the most efficacious remedies; for, whenever it has gone so far, as to induce even the smallest degree of effusion, we can never with certainty prevent either a partial, or perhaps a total loss of sight. The means best adapted for the removal of inflammation having been already detailed in Section II. of this Chapter, it is not necessary to repeat them; so that I shall now mention those remedies only on which we should chiefly depend for the cure of specks that are already formed.

In the management of specks upon the eye, it is a matter of much importance to attend to the particular nature of each of them; for the two varieties I have mentioned are so different from each other, that such remedies as prove useful in the one, are scarcely, if at all, admissible in the other: and hence we find, that the same applications being indiscriminately employed in every case, much injury is done which ought not to happen; and remedies fall into discredit, which when properly applied, prove highly useful.

Thus, we find by experience, that escharotics of a moderate strength may with safety be applied to the eye; and as specks upon the cornea are often removed by them, it has long been a common practice to apply them with equal freedom in every case. By attentive observation, however, to this branch of practice, I am convinced, that it is in one variety of the

disease only that remedies of this class ever prove useful; namely, in that which is attended with an evident prominency or elevation of the diseased part. In such instances, when the cornea beneath is found, the removal of this elevated opaque spot will leave it transparent, and fit for the purposes of vision; and in such cases, mild escharotics may with much propriety be employed: but in the other variety of the disease, where the effused matter seems to spread through the whole substance of that part of the cornea in which it is seated, without raising or elevating any part of it, no advantage is ever obtained from escharotics. In this case, the diseased part of the cornea, as I have formerly mentioned, does not seem to be thicker than the other parts of it; and it is impossible to destroy the effused matter without destroying the cornea itself. In such circumstances, the employment of escharotics can never be proper; and I have no hesitation in saying, that in this state of the disease, they can never be used but with much risk of doing harm.

It sometimes happens, however, even in this variety of the disease, that the patient recovers either a partial or even a complete use of his eye, by the opacity in the cornea being gradually carried off, probably by absorption taking place of the effused matter. As this has in some instances happened by a natural exertion of the system, practitioners should endeavour to assist this operation of nature, by employing such remedies as are known to prove most powerful in promoting absorption: with this view, there is nothing perhaps to be more depended on than a gentle course of mercury. In similar effusions in other parts of the body, mercury often proves useful; and it is the only internal medicine, which, so far as I have yet seen, should ever be employed in films or specks on the eye: issues have in some instances, too, appeared to prove useful; and as a cord in the neck in general discharges freely, it commonly answers the purpose in the most effectual manner.

With the same view, too, a brisk purgative given from time to time, proves sometimes useful ; but it must be acknowledged, that the effect of our practice in this disease is always uncertain : for, although in a few cases, some advantage has apparently been derived from these remedies, it has not happened so frequently as to admit of our placing much dependence on any of them.

But although we seldom derive advantage in this variety of the disease, either from internal medicines or external applications, it often happens in the other, that a due attention to the different circumstances of the case proves highly useful. As in this case we suppose the disease to be produced by a thin lamella of the cornea being elevated and separated from the rest of the tunic beneath, by an effusion of some kind of matter, and as this separated portion is in general opaque, our chance of effecting a cure is to remove it entirely. Even this will not always leave the eye perfectly clear and transparent ; for it sometimes happens, either from the effused matter having been of a sharp corrosive nature, or from its having been long confined, that a roughness, attended with some degree of opacity, is left upon that part of the cornea which remains. This, however, is not universally the case ; and, at any rate, although a complete cure may not in every case be obtained by the removal of the elevated part of the cornea, yet in almost every instance some benefit will ensue from its being thus made to admit a greater quantity of light to pass to the retina.

Spots of this kind may be removed either with the knife or with escharotics ; but, in general, the knife should be preferred. The head being secured by an assistant standing behind, and the eye properly fixed with a speculum, Plate XIII. fig. 1, the surgeon should seat himself in a convenient height between the patient and the clear light of a window ; when, with repeated small strokes of the knife, Plate XII. figure 4, he

should endeavour to cut away and remove all that portion of the cornea that he finds to be in any degree separated from the rest ; for no part of it that is loose will ever adhere again, and the cure will not be complete if any portion of it is allowed to remain.

The natural delicacy and irritability of the eye would appear to render this operation difficult ; but it may be done with ease by surgeons of steadiness and observation. The speculum I have mentioned fixes the eye completely ; and on the head being properly secured, the operation may be done with entire safety. The knife I have mentioned is in most cases the best ; but in a few instances a knife with two edges I have thought has answered better. A representation of a knife of this kind may be seen in Plate XVI. fig. 1.

Patients, however, will not always submit to this operation : in which case we are obliged to employ escharotics ; by a continued use of which we have it often in our power to remove blemishes of much firmness and of considerable extent : and although strong applications of this kind are not admissible, and have frequently done harm, by creating inflammation and pain, yet I think it right to remark, that there is no cause for so much caution on this point as in general we are led to believe ; for daily experience serves to evince, that a good deal of freedom may be used in the application of remedies of this class to the eye. It has been alleged, that, besides exciting pain and a temporary state of inflammation, escharotics must do harm by corroding and inducing ulceration on the sound part of the eye, just as readily as they will destroy the spot intended to be removed. This reasoning is specious, but not supported by experience ; for every practitioner must have observed, and it is particularly well known to itinerants, who commonly use no delicacy in matters of this kind, that specks upon the cornea are frequently removed by escharotics, without any kind of harm being done to the rest of the eye ; and the fact, I think, may be explained. So

far as I have been able to observe, those specks in which escharotics are employed with most advantage, consist of a substance in which there is little or perhaps no animal life ; at least they are perfectly white, are destitute of the circulation of red blood, and are so far insensible, that little or no pain is experienced from their being cut or even bruised with much freedom. Now we know, that in other instances, escharotic or corrosive applications of a moderate strength will destroy a part of a dead animal, which did not in any degree act on it during the life of the animal. This is particularly remarkable in a process that sometimes occurs in the stomach after death ; a curious fact, first taken notice of by the late ingenious practitioner Mr. John Hunter. The stomach has frequently been found on dissection to have holes corroded in it, even where no pain or other symptom of disease of this organ had previously existed ; from whence we may fairly conclude, that the liquor gastricus, or that fluid which nature has provided for the purposes of digestion, although during the life of the animal it may act only as a moderate stimulus to the viscera, yet after death, the stomach being now deprived of the power of resisting the corrosive property of this liquor, comes at last to be destroyed by it. In the same manner we may suppose, that a dead lifeless spot may be removed by corrosive applications, the strength of which is not sufficient to affect the living part of the eye.

We may thus perhaps account for the cause of this phenomenon ; but whether this reasoning shall appear to be well founded or not, the fact, as I have said, is certain, that corrosive applications may be made to the eye sufficiently strong for removing many of those spots to which it is liable, without doing any injury to the rest of the organ.

For a considerable time I was afraid to apply strong escharotics to the eye : further experience, however,

has convinced me, that they may be used with more safety than is commonly imagined.

Remedies of this kind may be used in different forms; but they are most conveniently employed in the form of a powder, an ointment, or a wash. When powders are used, they should be very finely levigated; otherwise, by their spiculæ, they are apt to irritate and inflame the eye: and, for the same reason, when conjoined with ointments, they should be very finely prepared. Articles of this kind that are soluble in water, are perhaps preferable to any; for, in the form of solution, they can never prove hurtful if their strength is duly regulated, as in this manner none of their sharp spiculæ can come in contact with the eye.

In the form of a powder, various articles have been employed; but the most effectual perhaps of any is red precipitate, or verdigris finely levigated, mixed with three or four parts of fine sugar. Calcined alum, too, white vitriol, and levigated glass, likewise mixed with a proportion of sugar, or with egg shells in fine powder, have frequently proved useful.

Ointments for the same purpose are prepared, by adding to fine hogs lard, or any emollient ointment of the same consistence, such a proportion of any of the powders I have mentioned as the patient is able to bear; and washes are made by dissolving a due proportion of the substance to be employed, in water. For this purpose, verdigris or white vitriol are employed with advantage; and in some instances I have known good effects result from a weak solution of corrosive sublimate. The following is a form of ointment much employed by Mr. Pellier, both for the removal of specks and inflammation. \mathfrak{R} . Mercur. precip. rub. Lapid. Calam. pp. $\bar{a}\bar{a}$ \mathfrak{z} iss. Lythargyr. pp. \mathfrak{z} i. Tutia pp. \mathfrak{z} ss. Cinnab. nativ. \mathfrak{z} i. F. pulv. tenuissim.: misce cum axungia porcina \mathfrak{z} ii. et adde balsam. Peruvian. gutt. xv.

Of this, a little is introduced on the end of a blunt probe, between the eyelids, evening and morning, at

the same time that a weak saturnine solution is employed as a wash.

It is impossible, in cases of specks upon the eye, to confine any application to the diseased part: all we can do is to insert the powder, ointment, or wash, within the eyelid; by the motion of which it is very quickly conveyed over the whole surface of the eye. In order, however to have every possible advantage from remedies of this class, their use should be long continued, and two or even more of them should be employed at the same time. Thus, a small quantity of any of the powders or ointments I have mentioned, may be inserted within the eye evening and morning, and a weak solution of corrosive sublimate, of verdigris, or white vitriol, may be employed two or three times a day for washing the eye.

It cannot be alleged, that these or any other remedies will in every instance prove effectual; but I can with confidence say, that a prudent and long continued use of them has often removed spots upon the eyes, which otherwise would probably have terminated in an entire loss of vision.

SECTION XIV.

Of Protrusions of the Globe of the Eye from the Socket.

EVERY practitioner must have met with instances of the eye being pushed more or less from its natural situation in the socket, and various causes are recorded of it by authors.

1. A partial protrusion of the eyeball takes place in some of the diseases of which we have treated in the preceding sections; particularly in the hypopion, staphyloma, and dropical swellings of the eye.

2. The eye may be displaced or pushed from its socket by external violence. And,

3. It may be raised or elevated by tumors forming beneath it.

Even the slightest distortion or displacement of the eye affords a very disagreeable appearance; and to those not accustomed to meet with it, gives much cause to suspect that vision will be completely destroyed by it. All such affections have therefore been in general considered as incurable: little or nothing has accordingly been done for removing them; so that patients labouring under them have for the most part been allowed to finish a miserable existence without any means being employed for their relief. But although vision cannot in every affection of this kind be preserved, yet in most instances it may be done; and wherever there is any chance of this being in our power, the attempt should undoubtedly be made.

As the means of cure must depend upon the cause by which the disease is induced, it is a point of the first importance to have it ascertained.

When the ball of the eye is enlarged from any of the causes I have mentioned; namely, from water, pus, or any other fluid collected in any part of it, if a portion of it is by this cause pushed forward, all that art can do is to diminish the size of the eye in the manner I have mentioned in different parts of the preceding sections, either by puncture, incision, or perhaps, by removing a part of it. In most cases of this kind, vision will be irrecoverably lost; but by the means I have mentioned, the deformity produced by the disease may be commonly removed.

When, again, the eyeball is pushed from its socket by external violence, as the optic nerve must in this case be suddenly stretched, we might *à priori* conclude, that vision would be destroyed by it. This will most frequently be the case; but it does not always happen: for, instances have occurred of the eye being pushed suddenly and entirely out of the socket, and on being replaced, of vision being as perfect as it was before.

Several years ago I met with an instance of this, in which the eye was almost entirely turned out of the socket by a sharp pointed piece of iron pushed in beneath it. The iron passed through a portion of the socket, and remained very firmly fixed for the space of a quarter of an hour ; during which period the patient suffered exquisite pain ; he was quite blind in the affected eye ; and the eyeball being pushed so far out as to give reason to suspect that the optic nerve was ruptured, it was doubted whether it would answer any purpose to replace it or not. As no harm, however, could arise from a trial being made of it, I resolved to make the attempt ; and with much pleasure and astonishment I found, on removing the wedge of iron, which being driven to the head was done with difficulty, that the power of vision instantly returned even before the eye was replaced. The eye was now put easily into the socket ; and the effects of inflammation being guarded against, the patient enjoyed very perfect vision.

A case of a similar nature to this is recorded by a very ingenious practitioner, Mr. White of Manchester : in which the eye was still more completely displaced than in the one I have mentioned, and in which the power of vision was scarcely affected.*

As in these cases the attempt to save the eye proved successful, where the eyeball remains entire, and is not altogether separated from the contiguous parts, we ought not to despair, however severe the injury in other respects may have been : nay, we here have evidence of no material inconvenience having ensued even from a sudden extension of the optic nerve. No such case therefore should be considered as incurable, till it has actually proved to be so by the power of vision being entirely lost after every endeavour for preventing it has failed. All extraneous bodies being removed, the eye should be cautiously replaced ; and

* Vide Cases in Surgery, &c. by Charles White, F. R. S. &c.

with a view to prevent or render moderate the inflammation, which otherwise might probably run high, bloodletting, both general and local, should be advised, together with a strict antiphlogistic regimen. At the same time, light should be excluded from the eye, and it ought to be kept covered with a soft compress moistened in a weak saturnine solution.

When the eye is pushed out by a tumor situated beneath it, the cure must depend on a removal of the cause. When an abscess or a collection of any kind of fluid is attended with this effect, a cure may be obtained merely by laying the cyst or abscess sufficiently open : but when the tumor is firm, it must be entirely removed.

Here I think it necessary to remark, that practitioners are in general too timid in operating on tumors of this kind, owing to their near contiguity to the eye ; inasmuch, that when a tumor is situated entirely within the orbit, a patient is commonly advised rather to allow it to remain than to submit to an operation. As long as no material inconvenience ensues from such tumors ; when they are not likely to degenerate into a worse nature ; and when they appear to remain stationary without receiving any additional increase ; it would surely be improper to advise a patient to undergo the pain and terror of an operation : but whenever they begin to acquire an additional bulk ; when there is any reason to fear that they may ever become cancerous ; and especially when they begin to impede the motion of the eye, and to push it out of the socket ; no further delay should be admitted. In such circumstances, the safety of the patient requires the tumor to be removed, and it ought to be done without delay.

Even where these tumors have acquired a considerable bulk, they are more easily removed than is commonly imagined. By proceeding cautiously, they may often be taken out without hurting the eye, even where they pass deep into the socket. But where the eye has already been pushed from its situation, as

nothing but the removal of the tumor can in any degree prove useful, it ought in every instance to be done, even although there should be some risk of the eye being hurt by it: for, besides the injury which such tumors do to the eye, when they increase to any considerable bulk, by pressing on the contiguous bones, they very commonly bring these likewise into a state of disease. In some instances, the bones become carious, and produce tedious ulcers; but most frequently they swell, become soft, and on being laid open, instead of the usual appearances of bone, they are found to consist of a clear gelatinous matter. In this state of the disease, no advantage can be derived from extirpating the tumor, so that it ought not to be advised; but this distressful situation may very commonly be guarded against, by the operation being done more early.

It sometimes happens, that the eye is pushed from its socket by an enlargement of the glandula lachrymalis. This forms a kind of tumor, of more difficult management than any other to which these parts are liable: we ought not, however, even in this case, to despair of effecting a cure; for even this gland, in a state of enlargement, has been entirely removed, without injuring the eyeball; and there will seldom be much difficulty in replacing the eye, on the cause being removed by which it was pushed out.

SECTION XV.

Of Cancer of the Eye, and Extirpation of the Eyeball.

THE eye, like every part of the body, is liable to cancer, a disease that cannot be cured by any remedy with which we are acquainted, and which therefore renders the removal of the diseased part necessary in order to prevent it from extending farther.

Cancer of the eye is apt to succeed to staphyloma : the ball of the eye, after becoming enlarged, at last protrudes beyond the boundaries of the socket : it acquires a firm, and even a hard consistence : vision is at last destroyed, and the tumor commonly acquires a red or fleshy appearance. In some instances, a yellow glutinous matter, but most frequently a thin acrid ichor, is discharged from the surface of the tumor. For a considerable time the patient complains only of heat, or a sensation of burning in the substance of the swelling ; but at last he becomes distressed with severe pains, shooting through the whole of it, and across the brain to the opposite side of the head.

In this situation, bloodletting, opiates, and the external use of emollients, are commonly advised, with a view to render the pain moderate ; but although in some instances this may be done by large doses of opiates, yet no remedy will prevent the disease from spreading ; and as it is always a point of importance to remove cancerous tumors early, the operation ought always to be advised as soon as the disease appears to be evidently formed.

In Chapter IV. Section VIII. we entered fully into the consideration of cancer. I there made it appear, that extirpation of the diseased part is the only remedy on which we ought to depend ; that it often succeeds when employed early in the disease ; that it must necessarily frequently fail, when the operation is long delayed ; and that practitioners have till of late years been often blamable, in having an ill founded aversion to this operation, by which their patients have in many instances been prevented from submitting to it so early as they ought to have done. For a more particular discussion of this point, I must refer to the section I have mentioned ; but it is here necessary to remark, that this general aversion to operate in cases of cancer, has been carried still further, when the disease is seated in the eye, than in any other part of the body.

This general objection prevails against the extirpation of cancer wherever it is seated, that the disease is so apt to return, that the advantage to be derived from it is seldom equal to the pain, trouble, and confinement that arise from it. This, I have elsewhere shewn, is by no means the case : but when the disease is seated in the eye, another objection has been raised to it ; namely, the hazardous nature of the operation ; for, as it is impossible, from the depth of the orbit, to secure any arteries with ligatures that lie at the under part of it, it has been supposed that much danger must occur from this circumstance alone : and accordingly, although we find the method of extirpating the eye has long been described in books, excepting by a few practitioners, the operation has been very seldom performed.

There is no cause, however, for this timidity : for although a good deal of blood is sent to the eye by different branches both of the internal and external carotid arteries ; yet, at the place where these are divided in extirpating the eye, they are commonly so much ramified, that no hazard, so far as I know, has ever occurred from this operation ; and I have not only done it frequently, but in various cases I have seen it performed by others. It is not the extirpation of a portion of the eye, namely, that part of it which protrudes beyond the orbit, that we are now considering, but the total removal of the whole eye, when it is altogether diseased. A partial extirpation of the eye is often indeed recommended, chiefly for the reason I have mentioned, the danger that is supposed to occur from a deep division of the ocular artery : but whenever the eye is in a cancerous state, as all the diseased parts must be removed in order to render the patient safe ; as I have endeavoured to shew that the eye may be altogether cut out without hazard ; and as no advantage can be derived from a portion of it being allowed to remain ; we should never hesitate in remov-

ing the whole. The method of performing the operation is this.

The patient should either be firmly seated in a proper light, with his head supported by an assistant ; or, what answers better in every tedious operation, he should be laid upon a table, with his head upon a pillow ; the most convenient posture not only for himself but for the operator. When the eyelids are diseased, they should be removed along with the eye itself ; but whatever part of them is found, should be allowed to remain as a protection to the orbit.

In the course of the operation, it is a point of importance to have the palpebræ kept completely separate ; for the most part this may be done by the hands of assistants, but in some cases where the ball of the eye is much enlarged, the palpebræ are more easily separated by means of two flat hooks, one of which is represented in Plate XIV. fig. 6.

When the eyeball has become so large as to protrude beyond the orbit, the operator will in general be able to lay hold of it with his fingers ; but when this cannot be done, a broad flat ligature should be passed through the centre of the tumor, in order to fix it during the operation. While this is done with one hand, the surgeon, with a common scalpel in the other, must endeavour to separate the whole ball of the eye from the different parts to which it is connected. All the diseased parts should be removed ; but care should be taken not to injure the bones ; for as in some parts of the body they are extremely thin, much harm might ensue from their being hurt.

On the eye being taken out, the attention of the operator is first directed to the hemorrhagy : but although in some instances this may take place to a considerable degree, yet it does not often happen ; for in general, the discharge of blood in this operation is so inconsiderable as scarcely to require the aid of compression to put a stop to it. But whenever it proceeds too far, it may be easily stopped by pressure ; or, a piece of dry

sponge being applied to the mouths of the bleeding vessels, pressure may also be employed, by stuffing the rest of the orbit with soft lint and applying a napkin over the whole, so as to make it press with some firmness on the sponge beneath.

When sponge, however, is employed, some attention is necessary in applying it; for when sponge is applied to the mouth of a bleeding artery, it is apt to adhere so firmly as to require a good deal of force, as well as some management, to remove it. Before inserting the sponge, therefore, a piece of strong waxed pack thread should be tied to it; by which it may be pulled out when the hemorrhage is suppressed.

As soon as a free suppuration takes place, the bandage and lint will be easily removed; and the only necessary dressing is a pledget of emollient ointment, to be continued as long as any discharge of matter takes place from the orbit.

In performing this operation, I have advised the common scalpel to be employed; and I have no hesitation in saying, that it is preferable in every respect to any instrument that has yet been proposed. Different forms of scalpels have been invented for this operation, particularly one with a considerable degree of curvature. As this has been in some instances employed, I have given a view of it in Plate XXI. fig. 1. But it does not answer the purpose so well as the straight scalpel; and in using it, we are more apt to injure the bones of the orbit.

The operation I have described, namely, the extirpation of an eye, is attended with much pain to the patient, and appears to be of a cruel and dangerous nature to bystanders; so that few surgeons have resolution to perform it. It ought in no instance to be advised where a cure can be accomplished by more gentle means; but when this cannot be done, and when a patient will for certain die in misery if the eye be not removed, it ought surely to be advised as the most certain means of affording at least some chance

of safety : for although it will not always answer, yet we know from experience, that in some instances lives have been saved by it, which otherwise would probably have been lost. We ought, however, to remember, that in every case of cancer, extirpation proves, *cæteris paribus*, most successful when practised early ; so that it should always be advised in cancer of the eye, as soon as it is evident that the disease is completely formed.

SECTION XVI.

Of Artificial Eyes.

AS the loss of an eye is always productive of much deformity, our being in some measure able to obviate this, is not unfrequently a desirable object ; and by the ingenuity of modern tradesmen, it is easily done.

A thin concave plate of glass, silver, or gold being fitted to the orbit, must be coloured so as to match the other eye as nearly as possible ; and if care is taken to render it perfectly smooth, it may be introduced beneath the palpebræ, and used without exciting pain. Of all these substances, however, glass is the most proper ; for it not only can be made to resemble the natural eye more exactly than the others, but it is much more cleanly. It has been objected to the use of glass indeed, that it is apt to break by blows and other accidents : of many, however, who I have known use this artificial eye, I do not remember an instance of any who ever were hurt by it.

An artificial eye may be fitted to any orbit, where the eye has either been sunk by the evacuation of part of its contents, or where a portion of the eyeball has been removed : but it seldom happens that any advantage is derived from this invention where the globe of

the eye has been entirely taken away; for when not supported beneath, the artificial eye sinks too deep into the orbit, and can never be made to fit properly. It is chiefly, therefore, in cases of hydrophthalia and staphyloma in which it has been found necessary to evacuate a portion of the contents of the eye, or perhaps to remove some part of it, that artificial eyes prove useful.

SECTION XVII.

Of Cataracts.

§ 1. *General Remarks on Cataracts.*

VARIOUS definitions have been given of the term cataract; some of which are sufficiently accurate, but others have rather tended to convey an improper idea of the nature of the disease.

Blindness, induced by an opaque body immediately behind the iris, forms the disease we name cataract; and as we find from dissection that this opacity is in every instance seated in the crystalline lens, or in its investing membrane, a cataract may with propriety be defined, to be a deprivation of sight induced by an opaque state of the lens or of its capsule.

The real seat of cataract being a late discovery, we need not be surprised at finding very perplexed and contradictory accounts of it in all our ancient surgical authors. By some it was considered as an affection of the internal surface of the cornea; others imagined that it was seated in the vitreous humour; whilst by many it was supposed to be produced by a new formation of a membranous substance within the cavity of the eye. By some this new production was supposed to be attached to the coats of the eye; while

others alleged that it usually continued loose, and floated in the aqueous humour. Some writers of eminence, too, appear to have confounded the gutta serena with this disease, the former being often mentioned and described under the name of the black cataract.

The fact, however, is now ascertained, that cataract, in a pure unmixed form, depends entirely on a diseased state of the lens or of its capsule ; and its appearance indeed is so distinctly marked, that no practitioner of experience can ever mistake it : but for the advantage of beginners, and of others not accustomed to this branch of business, I shall, in the first place, give a short history of the rise and progress of the disease and shall afterwards endeavour to point out such circumstances as distinguish it more particularly from some other affections of the eye.

Instances sometimes occur, in which cataracts form suddenly, and a total loss of sight, with complete opacity in the lens, takes place at once without any previous affection. This, however, is rare ; and it commonly happens, that the disease approaches in a very gradual manner, from a slight degree of dimness, with which it commences, to an entire loss of vision.

The first symptom that usually occurs in cataract is what the patient terms a weakness of sight, and which commonly takes place long before any alteration is perceived in the state of the lens. By degrees this weakness, or rather dimness of sight, becomes more considerable ; and the patient being from his feelings led to suppose that it is in some measure produced by dust or motes floating in the air, or by some opaque matter upon the external surface of the cornea, is often employed in rubbing his eyes ; and is surprised to find that his sight never becomes clearer from his doing so.

If in this state of the disease the eye is examined, the lens will be observed to have acquired a dusky hue ; and instead of being clear and diaphanous, which it naturally is, it will be found to be slightly

opaque. By degrees the dimness of sight becomes more distressful, till at last it terminates either in total blindness, or perhaps the patient may be able to distinguish light from darkness; but in the advanced stages of the disease, he can seldom distinguish colours, excepting those of the brighter kinds, nor can he find his way in roads where he is not perfectly acquainted.

In proportion to the degree of blindness that takes place, the lens is observed to become more and more opaque, till at last it is found to be either entirely white, or of a light gray or pearl colour. In a few instances this whiteness is confined to a small portion of the lens, and forms a small opaque spot in some particular part of it; but in general, the whole body of the lens is equally diseased.

During the whole course of the disease, the pupil contracts and dilates according to the degree of light in which it is placed; at least this will be always observed when the eye is not otherwise diseased. Cataracts, however, are often combined with gutta serena; in which case the pupil is not affected by any degree of light we apply to it: this, indeed, does not proceed from the state of the lens, but from the diseased state of the optic nerve.

Cataracts are not commonly attended with pain; but in some instances it is otherwise, when every exposure to light creates much uneasiness. This, however, is always to be considered as an accidental circumstance, depending probably on some degree of inflammation at the bottom of the eye, and not as a necessary symptom of cataract.

I have already observed, that cataract has been confounded with other diseases. This however, can only happen from inattention; for there is scarcely any other disease to which it bears much resemblance. But in books, we find it has been mistaken for the gutta serena; for the hypopion and staphyloma; and it has

been confounded with white opaque spots on the cornea.

It is easily distinguished, however, from all of these. In cataract, the pupil contracts when exposed to much light, and an opaque body is observed behind the iris : whereas in an unmixed case of gutta serena, the pupil remains in a state of dilatation whatever degree of light is applied to it, and no opacity is observed at the bottom of the eye : it is distinguished from the hypopion, staphyloma, and white spots upon the cornea, by the evident marks of disease which in all of these take place in the anterior part of the eye, the cornea itself ; which in all of them is opaque, and which in the hypopion and staphyloma is commonly elevated into a small tumor or protuberance : whereas in cataract, the only symptom that occurs, is, blindness to a greater or less degree, attended with a white opaque spot behind the iris, the cornea and every other part of the eye remaining perfectly sound. I have already observed, that this opacity is found by dissection to depend upon a morbid state of the lens. For the most part it is the body of the lens only that is diseased ; so that the opacity is removed, and the eye appears perfectly clear on this being taken out : but in a few instances, the membrane or capsule that surrounds the lens is the seat of the disease ; so that the same degree of opacity still continues even after the lens is removed. This, however, is not a frequent occurrence ; but it is sometimes met with, and is with sufficient propriety termed the membranous cataract.

It is difficult, or perhaps impossible, to ascertain the proximate cause of cataract ; but I think it probable, that it consists in some degree of obstruction of the vessels of the lens, in some instances induced by external violence, but most frequently by some internal cause, for which we cannot properly account.

The existence of vessels in the crystalline is doubted indeed by many, who imagine that nourishment is conveyed to it by the small quantity of fluid that we

meet with in the capsule of the lens. But the fact I consider as established, that the lens is supplied with vessels from its capsule, injections having been made to pass from one to the other, not only in different animals, but in some instances in the human eye. But whether this could have been demonstrated or not, the existence of vessels in the lens, is rendered, I think, sufficiently probable, by a circumstance I took notice of in the history of the disease, namely, the sudden formation of cataracts, which in a few cases has been observed. I have now met with several instances of this ; in some of which the most complete degree of opacity took place in the crystalline in the course of a few hours from the first sensation of dimness ; a fact that cannot be so readily explained on any other supposition.

It may be alleged, where the cataract is so speedily formed, that the opacity may arise from disease in the vessels of the capsule, and not of the lens itself. In some instances this may be the case ; but in more than one of those to which I allude, the disease appeared to be fixed in the body of the crystalline, and the capsule remained perfectly sound ; for on the lens being extracted, the opacity was entirely removed.

In confirmation, too, of this opinion, of cataracts being probably produced by some degree of obstruction in the vessels of the lens, I may remark, that they occur more frequently in women about the cessation of the menses than at any other period ; and we know that this period is particularly productive of obstructions in other parts of the body.

As long as the opinion prevailed of there being different species of cataracts, a variety of means were advised in the method of cure ; but now that the real nature of the disease is known, our sole object is to remove the opacity of the lens ; or when this cannot be done, we remove the lens itself from the axis of vision.

In confirmed cataracts of long duration, no advantage is ever derived from any internal medicine; but in the incipient state of the disease, before the opacity of the lens is complete, mercury has in some cases proved useful. When inflammation takes place, blood-letting both general and local; the application of blisters to the temples, together with a strict antiphlogistic regimen, should be advised; and I have in a few cases derived advantage from the operation of brisk purgatives; but nothing I have ever tried has answered so well as small doses of calomel often repeated. *Extractum hyoscyami*, *flammula jovis*, and other vegetable productions, have likewise been celebrated for their efficacy in cataract; but no trials that I have given them, and I have used them all in different instances, can justify the recommendation.

When mercury, and the other remedies we may employ, are found to fail, our next object, as I have already observed, is to remove the diseased lens from the axis of vision: this we accomplish by one or other of two chirurgical operations, namely, by pressing the lens from its natural situation in the centre down to the bottom of the eye, an operation commonly termed couching the cataract; and that operation which we denominate extraction of the lens, by which the diseased body is taken entirely out of the eye.

Each of these operations has been much employed; so that the merits of both ought long ago to have been ascertained: but although the subject is of the highest importance, it still remains in a state of uncertainty. By some practitioners, couching is preferred; whilst others consider extraction of the lens as the only remedy on which we should place any dependence.

The uncertainty in which we still remain upon this point, proceeds, I believe, from this branch of practice having hitherto been for the most part in the hands of itinerants: and as practitioners of this denomination, have uniformly from their first outset in life, adopted one method of operating only, they have

very universally condemned the other ; which they themselves neither practise, nor perhaps understand : so that regular practitioners, not being able to determine from their own experience, they have in general remained upon this point very undecided. But the public appearing now to be convinced of the propriety of intrusting this, as well as every other operation of importance, to established surgeons of reputation, opportunities will thus be afforded of determining the point in question by experiment ; the only means by which any degree of certainty can be obtained.

In prosecuting the consideration of this subject, I shall endeavour to point out as clearly as possible the result of my own observations upon it, together with that of some of our best employed surgeons. With this view, I shall first describe the operation of couching ; and after considering the different steps of the operation of extracting the cataract, I shall attempt to draw a just comparison of the merits of the two.

§ 2. *Of Couching, or Depression of the Cataract.*

I HAVE already observed, that the operation of couching consists in pressing the cataract or diseased lens from its natural situation in the centre down to the bottom of the eye. By this means the opacity producing the disease is removed from the axis of vision ; and although the sight is never so perfect as before the lens became opaque, when the eye is otherwise sound it proves quite sufficient for the common purposes of life.

In the anatomical description of the eye, which makes the subject of the first part of this chapter, we have seen, that the lens is placed behind the pupil, where it is lodged in a slight depression of the vitreous humour, to which it is attached by a capsule, formed by a portion or lamella of the tunic which includes the vitreous humour itself. In couching, the lens is separated from its capsule ; and being pressed down

behind the iris, if the operation succeeds, it either remains there during life, or is dissolved in the aqueous humour in which it is lodged.

Before we proceed to this operation, some circumstances in a particular manner require attention ; the most material of which are, the degree of opacity in the lens, and the state of the eye with respect to other diseases.

It is a fact well known to practitioners, that no operation can be performed on the eye, but with the risk of inducing inflammation ; a symptom that proves tedious, or otherwise, according to the constitution of the patient, and other circumstances of the case. This points out the propriety of proceeding with caution, and of attempting no operation on this organ, not absolutely necessary for the welfare or comfort of the patient. Where a patient is rendered so blind by cataracts in both eyes, that he cannot conduct himself in the common occurrences of life, we should not hesitate in advising an operation for his relief. In such circumstances, any risk of his suffering from inflammation is more than counterbalanced by the advantages he may derive from the operation. But when one eye only is lost, and the patient enjoys a perfect use of the other ; or where even both eyes are diseased, if the opacity of the crystallines is not so considerable as to prevent the patient from managing his ordinary business ; or if it does not deprive him of his sight in any considerable degree ; in any of these circumstances, a prudent practitioner will rather avoid an operation, and will advise it to be delayed as long as vision remains tolerably perfect.

The ingenious Dr. Richter of Gottingen, is indeed of opinion, that the existence of cataract in one eye is particularly apt to produce a similar affection in the other, and therefore he advises the crystalline to be removed as soon as it becomes entirely opaque, whether it is diseased in the other eye or not. The propriety, however, of this advice can be only determined by

further observation ; but it often happens, that together with an opaque state of the crystalline, the eye is in other respects so much diseased, as to afford no hopes of vision being restored by the cataract being removed ; in which case, as no advantage could be derived from an operation, it ought not to be advised. This is particularly the case in the hypopion, in the gutta serena, and in every affection of the eye attended with an opaque state of the cornea.

Writers on this subject mention another reason, by which they think that practitioners should be determined, when the operation in cases of cataract should be advised. It has very universally been supposed, that a cataract ought to be in a particular state, in order to ensure success from an operation ; inasmuch that we are advised never to operate unless this state of the disease is found to prevail. The state to which I allude, is a supposed state of maturity, which it is believed every cataract will sooner or later arrive at, and which is said to be clearly and evidently pointed out by certain appearances of the opaque crystalline.

It is true, that both in the operation of couching and extracting the cataract, the lens is sometimes found to be partly soft and in part very firm, and in a few cases it is even perfectly fluid ; a circumstance commonly considered as unfavourable : but although this may have first suggested the idea of the unripe state of a cataract, as it is termed, yet no advantage has hitherto been derived from the distinction ; for notwithstanding a variety of signs have been mentioned, by which the real state of a cataract is said to be evidently marked, yet it does not appear to be supported by experience : on the contrary, we often find that a cataract is of a firm texture, that was previously suspected to be soft ; and vice versa.

Nothing, indeed, can render it more obvious, that this idea of the mature state of a cataract is ill founded, than the variety of opinions that prevail respecting it : for while by some it is said that this state of the

disease is indicated by a pure white or milky appearance, others assert, that a light gray or pearl colour is the most certain mark of it. Now, the fact is, that the real state of a cataract can never be known from its colour; and the best informed practitioners will allow, that no advantage is to be derived from this means of distinction.

The idea of a cataract being more ripe at one period of the disease than at another, originated, as I have observed above, from the crystalline being in some instances found to be fluid, which gave cause to suspect that the first effect of a cataract is to induce a softness of the lens, and that this soft or fluid state of it is gradually altered by the progress or continuance of the disease, by which it is supposed to acquire a firm consistence, when it is conceived to be thoroughly ripe.

This opinion, however, of this being necessarily the first effect of a cataract upon the lens, is equally ill founded with the idea I have mentioned, of the real state of the disease being to be distinguished by its external appearance; for we know from experience, that cataracts are often of a firm texture from the beginning. From my own observation, indeed, I would say, that the most frequent effect of cataract upon the lens is to produce a preternatural degree of hardness through the whole of it; as, for the most part, an extracted opaque crystalline is of a firmer texture than it is ever found to be when healthy and transparent.

We are, therefore, to conclude, with respect to this circumstance of the ripe or unripe state of a cataract, that in the treatment of the disease no advantage is to be derived from any thing we yet know concerning it. In the common acceptance of the term, indeed, the word ripeness has in this respect no determined meaning affixed to it: I would therefore propose, that instead of being employed to signify the *appearances* of a cataract, it should be applied only to express the *effects* that arise from it. In this manner, the term might still be retained with propriety; for we might

very properly say that a cataract is ripe when the patient is rendered entirely blind by it, and when therefore it is ready for an operation ; and, on the contrary, that the disease is still in an unripe state, as long as vision is not much impaired by it.

As the state or consistence of a cataract, is much insisted upon by almost all who have wrote on it, I here judged it right to enter on this inquiry ; and, on the whole, this conclusion I think may be drawn from what has been said, that in determining upon the propriety of operating, we are never to place any dependence on the appearance of the lens ; that we are to be solely directed by the effects which cataracts produce, and by the state of the eyes with respect to other diseases. As long as vision remains tolerably perfect, whether in both or only in one eye, for the reasons I have given, a prudent practitioner would rather avoid the operation : but, when the sight becomes much impaired, if the cornea is found to be transparent, and if the pupil dilates and contracts freely, according to the degree of light to which it is exposed, we should not hesitate in advising an operation as the only effectual means of relief. And when the operation of couching is agreed on, the following is the method of doing it.

As it is of importance in this as well as every operation upon the eye, to guard against inflammation, nothing should be omitted that can in any way tend to prevent it : the patient should be confined, for several days before the operation, to a low regimen : he should lose ten or twelve ounces of blood, and even more if his strength admits of it, and two or three purgatives should be given at proper intervals.

In performing this operation, and likewise in extracting the cataract, a large quantity of light is necessary ; but no sunshine should be admitted ; for by the irritation which it excites, the eye is prevented from being kept so steady, even with a speculum, as it oth-

erwise may be. A north exposure should therefore be preferred.

The only apparatus to be provided for this operation, is a speculum of a proper construction, and of a size adapted to that of the eye; and an instrument termed a needle, for the purpose of depressing the cataract. Different forms of the needle are represented in Plate XV.; and in Plate XIII. are delineated different views of the most useful speculum that has yet been invented.

As it is of much importance to have the eye properly fixed during the whole course of the operation, and as this is best done with a speculum exactly fitted to the eye, every operator should be provided with several sizes of this instrument.

The best needle for this operation is that of a flat form, represented in Plate XV. fig. 1.

The patient should be placed upon a low seat with his face towards the window, and the surgeon, upon a chair considerably higher, should be seated directly before him: an assistant standing behind must be directed to support the patient's head, which is most effectually done by placing one hand under the chin, and the other on the forehead; and in order to prevent interruption, the hands of the patient should be firmly secured by an assistant on each side.

During the operation, it is of much importance for the surgeon to have his hand and arm firmly secured: for this purpose, nothing answers so well as a proper rest for the elbow, which ought therefore to be placed either upon a table, or on the knee of the operator raised to such a height that it may be nearly on a line with the eye of the patient. Practitioners usually trust to the hand being secured by the ring and little fingers resting on the cheek or temple of the patient: but this seldom proves sufficient for the perfect steadiness which operations on the eyes require; and whoever will make trial of the mode I have mentioned of fixing the elbow, will find it preferable. It is proper, indeed,

that any advantage to be derived from resting these two fingers upon the cheek should be likewise laid hold of; but this alone should not be relied on.

An ingenious author, who has lately written on the cataract, has communicated some valuable practical observations to the public.* His method of giving support and steadiness to his hand during the operation of extracting the cataract, and the same observations, I may remark, apply with equal propriety to that of couching, is to press the upper part of the arm and elbow of that hand with which he performs the operation, strongly against his own breast and ribs, and to rest his little finger about an inch from the outside of the eye, on the cheek bone of the patient, at the same time that he retains his breath, and remains as much as possible in that situation, till the incision of the cornea is finished. He has also invented a chair, for the purpose of fixing the head of the patient, which he has used for many years with much advantage. He very properly observes, that in the usual method of fixing the head, by pressing it against the breast of an assistant, that the least motion, even that which occurs from the assistant drawing breath, must occasion a corresponding motion of the head of the patient. The chair that he has invented, is represented in Plate XXIX. and it appears to be well calculated for the purpose for which it is meant.

Whether the patient is seated on this chair, or in the manner I have advised above, the assistant is now to raise the upper eyelid with the fingers of his left hand; and the surgeon applying the groove in the upper part of the speculum, Plate XIII. fig. 1. in such a manner that it may receive the edge of the eyelid, the opening or circle formed by the brim of the speculum is to be pressed upon the ball of the eye, till the transparent cornea, and nearly about an eighth

* Vide a Treatise on the extraction of the Cataract, by Frederick Bifchoff, F. M. S. Oculist to his Majesty in the Electorate of Hanover, and to her Majesty in England.

part of an inch of the sclerotica, is protruded; by which means, if a steady and equal pressure is continued upon the eye, it will be kept firmly fixed without any injury being done to it, at the same time that a sufficient quantity of the ball will be left uncovered by the speculum for the purpose of the operation.

I am at present supposing that the operation is to be performed upon the left eye. For this purpose, the patient being secured in the manner I have advised, the speculum being applied and secured by the surgeon's left hand, and the surgeon himself being seated, with the elbow of his right arm fixed at a proper height, he must take the couching needle in his right hand, and having fixed it, as we do a pen in writing, between the thumb and fore and middle fingers, while the ring and little fingers are made to rest upon the cheek or temple of the patient, the point of the instrument must now be made to pass the external canthus of the eye; and being brought nearly in contact with the sclerotica, it should now be quickly plunged through this coat, somewhat below the centre of the eye, and about one-tenth of an inch behind the iris. In Plate XVII. fig. 1. is delineated a needle passed into the eye in this manner, by which a better idea is given of the operation than can be done by any description.

In order to avoid the iris, the instrument should be introduced with its flat surface towards this membrane, and should be carried forward in a straight direction till the point of it is discovered behind the pupil, as is represented in the figure I have mentioned. By depressing the handle of the needle, the point of it will be raised, and the flat surface of it being turned downwards, it must now be pushed into the upper part of the crystalline, when the operator, by elevating the handle, must endeavour to carry the lens upon the point of the instrument down to the bottom of the eye; which will be instantly discovered, on the surgeon observing through the pupil that the cataract dis-

appears, and by the patient becoming sensible to the impression of light.

Were we sure of the lens continuing at the bottom of the eye, the needle might now be withdrawn, and the operation would be finished : but as we know from the anatomy of the eye, that there is a portion of the aqueous humour lodged between the vitreous humour and the iris ; as it is into this part of the aqueous humour that the crystalline is depressed ; and as this humour is of a consistence too thin for preventing the action of the muscles of the eye from raising the lens again on the pressure of the instrument being withdrawn ; we need not be surprised at the operation being frequently found to fail on being finished in this manner.

Instead of this, on the crystalline being pressed to the bottom of the posterior chamber, it should be slowly carried on the point of the instrument towards the outer and back part of the eye ; a movement which is best accomplished, by the operator raising his hand so as to elevate the handle of the needle, at the same time that he makes it pass somewhat outward over the cheek. In this manner, the crystalline is to be partly lodged below the vitreous humour ; which being of a firm consistence, very commonly prevents it from rising again ; and being brought towards the external canthus of the eye, if it should afterwards be forced up by the action of the muscles, not being opposite to the pupil the passage of light to the retina will still remain clear, and vision will accordingly be no more affected than if the cataract had remained at the bottom of the eye.

As soon, therefore, as this movement is finished, the needle should be withdrawn ; and there being now no further use for the speculum, it should likewise be taken off : but as it is of importance to have the eye properly fixed during the whole course of the operation, the speculum should not be removed till the whole is finished.

On the instrument being taken away, practitioners commonly try what effect is likely to result from the operation, by presenting different objects to the patient: but although no harm ensues from slight trials of this kind, they should never be carried far; for they may do harm by tending to promote inflammation, while no real advantage can ever arise from them.

After the operation, a compress of soft lint, soaked in a weak saturnine solution, should be lightly applied over the eye; and this being retained by the bandage, Plate XXX. fig. 3, the patient should be confined in a dark apartment, and kept on low diet as long as there is any risk of inflammation taking place: with the view, too, of preventing this, a dose or two of a brisk purgative should be exhibited; and, when necessary, blood should be taken from the temporal artery, from the jugular vein, or from the neighbourhood of the eye, with leeches.

The eye should be looked at daily, that the real state of it may be known; but the patient, for a considerable time, should be kept in an obscure light, with his eyes sufficiently covered.

For the most part, we discover in the course of a few days whether the operation is to succeed or not, but in some instances the patient remains for a considerable time perhaps equally blind as before, and yet gradually recovers the power of vision afterwards, so as to distinguish objects equally well as if the operation had proved successful from the first. This I suppose to happen from some degree of inflammation being produced in the capsule of the lens, by the violence done to it by the couching needle, and till this is entirely removed, that the effect of the operation cannot be ascertained.

On removing the coverings from the eye, if the cataract is not discovered, the object of the surgeon is completed; but if the lens has again got into its usual situation, after a further delay for the purpose of al-

lowing the inflammation induced by the first operation to subside, another attempt should be advised; and a second or third I have frequently known to succeed, when the first had entirely failed: this, in a great measure arises from the circumstance to which I have already adverted, the needle being withdrawn immediately on the lens being pressed to the bottom of the eye; for this being done, it is in general supposed that the operation is finished. I have endeavoured however to show, that this is by no means the case; and that the cataract will seldom rise again if it be pressed towards the external canthus of the eye, and gently pushed beneath the vitreous humour.

Those who have not operated in this manner, will perhaps object to it, that by forcing the lens into the vitreous humour, an unnecessary violence is thus done to this part of the eye, by which it must be so much injured, as to have some influence on the success of the operation. This, however, does not on experience appear to be the case; for I have often done the operation in this manner, and I never observed any harm ensue from it. We should not wantonly hurt the vitreous humour; but we know that it is often much more materially hurt in extracting the cataract, and with little apparent detriment to the eye, than it can ever be in the operation of couching. Thus it often happens, in extracting the lens, that a considerable portion, or even the whole of the vitreous humour, is discharged, and yet the operation succeeds equally well as if no such occurrence had taken place. This, indeed, every operator would rather wish to avoid; but it shows clearly, that no injury of importance can be done to vision by the practice I have advised, of lodging the cataract in the operation of couching, partly beneath, or even entirely in, the substance of the vitreous humour.

The operation I have described is supposed to be done, as I have already observed, upon the left eye; for which purpose the right hand of the operator

must be employed : but in operating upon the right eye, if the needle is to be entered in the usual way, from the outer or external canthus of the eye, it must either be done with the left hand of the surgeon, or, if he wishes to use his right hand, he must either sit or stand behind the patient, when, by supporting the head upon his breast or upon his knee, he may in this manner accomplish his purpose. This mode of operating upon the right eye has been frequently practised even by surgeons of eminence, but it is extremely awkward ; and besides, the operator can never have such a full command of the eye when he sits or stands behind, as when placed before the patient. Few surgeons, however, are so alert in using their left hand, as to be able to perform with it this very nice operation ; so that with the usual instruments there is no other alternative than that of doing it from behind. But in Plate XV. fig. 4. and 5. there is delineated a form of needle, by which the operation may be done with ease and safety on the right eye with the right hand of the surgeon, whilst he is seated before and opposite to the patient. Only in this case, instead of entering the instrument at the usual place, by pushing it inwards from the external canthus of the eye, it must be entered at the internal angle, and pushed outwards, as is represented in Plate XVIII. figure 1. In every other respect the operation is to be conducted as I have already directed ; only, the cataract, instead of being carried to the external canthus of the eye, must in this case be drawn by the point of the needle towards the nose. In this manner the operation may be done upon the right eye by any surgeon who can perform it upon the left ; an improvement that many will judge to be important.

As the operation of couching is very universally performed without the assistance of a speculum, it may be considered as an affectation of singularity to recommend one. In answer to this I must observe, that although the cataract may be depressed without the

use of a speculum, it may be done more perfectly, and with more ease both to the patient and surgeon, when a speculum is employed, than when it is not. By means of the speculum, delineated in Plate XIII. as well as with that in Plate XXII. fig. 5. the eye may be very firmly fixed, which allows the operator to manage the needle with more ease than can otherwise be done.

It has been commonly objected to the use of the speculum, that it does not secure the eye sufficiently ; and that it always proves detrimental, by exciting inflammation over the eyeball. This observation, I believe, is well founded with respect to the instrument in ordinary use, of which a delineation is given in fig. 3. Plate XII. But it does not apply to either of the others ; which, when properly fitted to the size of the eye, secure it exactly ; and when finely polished, never do harm.

Some practitioners, sensible of the impossibility of fixing the eye properly in the manner commonly attempted with the fingers alone, and finding the common speculum insufficient, have proposed another instrument for this purpose : it consists of a sharp spear or prong, fixed in a handle, with a cross flat bar near the point, as is delineated in Plate XII. fig. 2.

This instrument has long been employed in some parts of the Continent : it is used by pushing the point of it through the sclerotic coat on the side of the eye opposite to where the needle is to be entered ; and it is prevented from penetrating far, by the cross bar with which it is furnished : in this situation, it is secured by an assistant on one side of the patient ; and the eyelids being separated by the surgeon himself, assisted by the person behind who supports the head, the eye may in this manner be fixed in some degree, but never with so much ease and certainty as with either of the speculums I have mentioned.

Needles of various forms and sizes have been used in this operation ; but the flat needle, figure 1. Plate XV. answers the purpose better than any that I have tried. It ought not to be broader than this, otherwise it makes too large a cut in the coats of the eye ; and if much narrower, it does not so readily carry the lens along with it. The round needle, fig. 2. of the same Plate, has been much employed by many itinerants ; but I have not found, upon trial, that it answers so well as the other. After piercing the cataract, it parts with it too easily : and besides, it enters the coats of the eye with more difficulty, and it cannot be so easily moved when introduced as the other ; which being broad in the cutting part of it near the point, the opening formed by it in the tunica sclerotica is somewhat larger than the diameter of the rest of the instrument, which admits of its being afterwards easily moved in every direction.

It has been objected to the flat needle, that by its breadth it is more apt than the round one to hurt the iris ; but with the precaution I have mentioned, of introducing it with the flat surface towards this membrane, there can never be any hazard of this. The flat part of the needle may indeed be made too broad, and this I believe is very commonly done ; by which the opening made with it is too large ; more irritation is thus excited ; and when broad near the point, it does not so readily penetrate the lens as a narrow needle would do. The needle delineated in Plate XV. fig. 1, is in every respect of a proper size. Fig. 3, represents a needle with a small degree of curvature, by which I have sometimes thought that the cataract may be more easily depressed than with a straight needle ; but I have not yet used it so frequently as to be able to speak of it with decision : in piercing the eye with it, the convex side of the curve should be towards the iris, as this membrane would be apt to be injured, were it introduced in any other manner.

In describing the operation, I desired that the needle might be entered at one side of the eye, by passing it through the sclerotic coat at the distance of one-tenth of an inch from the iris. And I likewise observed, that it answers the purpose better by introducing it somewhat below the centre of the eye, than if entered, as is usually done, in a line with the centre of the pupil. It ought not, however, to be far below this point. The twelfth part of an inch is fully sufficient; for when the needle is introduced near the bottom of the eye, the cataract is not so easily depressed with it.

It has been said by some, that the operation may be performed, not only with more ease, but with more safety, by introducing the needle through the transparent cornea, and after passing it through the pupil, to push down the cataract with the point of it to the bottom of the eye. It is not, however, probable, that this proposal can ever be generally admitted, for it is not possible in this manner to depress the lens so easily as when the needle is entered in the manner I have advised, while it can scarcely be done without hurting the iris.

§ 3. *Of Extracting the Cataract.*

THE operation of couching, or depressing the cataract, had been long practised, and was considered as the only means by which an opaque crystalline could be removed, till the year 1737, when an eminent oculist of Paris, Mr. Daviel, first proposed and practised the method of removing it by extraction.

It is true, that several years previous to this period, Mr. Petit proposed to make an opening through the transparent cornea, for the purpose of removing the lens when forced into the anterior chamber of the eye, either by accidental violence, or when pushed through the pupil in the operation of couching, an occurrence

which sometimes happens : but, being considered as extremely hazardous, it was rarely practised ; nor was it ever supposed to be proper in any other state of the disease, till Mr. Daviel, about the time I have mentioned, put it frequently in practice, in preference to the operation of couching. By some, the merit of this operation has been attributed to our countryman Taylor, a famous itinerant of these times ; but this will not be admitted by any who have paid attention to the history of it, given by those who had the best opportunities of being able to judge of it.

This operation consists in an opening being made through the transparent cornea, of a sufficient size for admitting the passage of the lens after it has passed through the pupil into the anterior chamber of the eye. The operation itself was nearly, if not exactly, the same when practised at first by Mr. Daviel, as it is at present ; but the method of doing it then was more difficult and tedious, by a greater number of instruments being used in it than are now found to be necessary. At that period knives of different forms were employed ; as also, scissars, forceps, a lancet concealed in a canula for opening the capsule of the crystalline, as well as many others. In the present improved state of this operation, the only instruments we employ are, a speculum for fixing the eye ; one or other of the knives, Plates XVI. XXII. and XXX. a small scoop, Plate XVI. fig. 4. and a flat blunt crooked probe, Plate XVIII. fig. 5.

In proceeding to this operation, the patient should be placed in the same kind of light, and secured in the same manner as I have advised for the operation of couching. The surgeon should likewise be seated in the same manner before the patient, and ought to rest his elbow either upon a table, or upon his knee raised to such a height as to bring his hand nearly on a line with the pupil.

This being done, if the operation is to be performed on the left eye, the speculum must be applied in

the manner I have advised in the operation of couching, and must be pressed upon the eye with the left hand of the operator with as much firmness as is necessary for securing the eye; but more than this should be avoided, as it not only gives more pain, but is apt to press the cornea into too near contact with the iris; by which the latter is in great risk of being injured in the subsequent steps of the operation.

The surgeon is now to take the knife between the thumb and fore and middle fingers of his right hand, allowing nearly an inch to project past the extremity of his middle finger; and the point of it being brought in contact with the lucid cornea, it must be made to penetrate this coat at the distance of the sixteenth part of an inch or thereby from the iris, in a line running from the external canthus of the eye directly across the centre of the pupil, as is represented in Plate XVII. fig. 2.

The convex surface of the knife being still kept next to the iris, it must be carried slowly forward in this direction, till the point of it reaches the other side of the eye directly opposite to where it entered; and must here be pushed out till nearly a quarter of an inch of it is freely through the cornea. The operator is now, in a gradual manner, to form a semilunar cut in the under part of the cornea, by moving the knife downwards in such a manner, that all that portion of the cornea lying between the point at which it entered and that at which it passed out, may be divided at an equal distance from the iris; as is represented in Plate XVII. fig. 4. In this manner an opening will be formed sufficiently large for the passage of the cataract.

While this semilunar cut is forming in the cornea, the pressure of the speculum upon the eyeball should be gradually lessened, otherwise the vitreous humour will be forced out on the incision being finished. We are advised indeed by some to remove the speculum altogether on the knife being passed out at the oppo-

sive side of the eye ; for which purpose they leave an opening on one side of the instrument, to admit of its being taken off; as is represented in fig. 3. Plate XIII. But with an operator accustomed to the use of the speculum, there is no necessity for this precaution ; for a degree of pressure may be made with it sufficient for fixing the eye, without any risk of forcing out the vitreous humour ; and by keeping the eye fixed to the last, we are enabled to form the incision with more accuracy than can possibly be done when the speculum is removed early in the operation. I have seen it indeed often done in this manner ; but as soon as the eye has lost the support of the speculum, the pressure of the knife is apt to draw the eyeball too much down on the under edge of the socket, by which a smaller segment of a circle is commonly formed than is sufficient for the passage of the lens ; for by the eye being drawn suddenly down on the speculum being removed, the under part of the incision is almost always formed at too great a distance from the iris, and is thus made too small for the purpose.

When the eyeball has been too forcibly compressed by the speculum, the cataract, together with all the aqueous humour, and a considerable portion of the vitreous, are very commonly pressed suddenly out ; but when this part of the operation is properly done, nothing but the aqueous humour passes out.

As soon as the incision is finished, the operator must lay aside the knife ; and having lifted the flap formed in the cornea with the flat crooked probe, Plate XVIII. fig. 5. the point of it should be passed through the pupil, in order to scratch an opening in the capsule of the lens ; or this may be done with the instrument represented in Plate XXIV. fig. 2. and 3. This being accomplished, the cataract will either pass out at the cut in the cornea, by the action of the muscles of the eye ; or when this does not happen, it must be forced easily out by very moderate pressure, applied over the globe of the eye with the finger.

It happens indeed in some instances, that a good deal of pressure is required to force the cataract out : but this always proceeds from some fault in the previous steps of the operation ; almost universally indeed from the cut in the cornea being too small, by which the lens is with difficulty forced through the pupil ; or if it is made to enter the anterior chamber of the eye, it does not pass through the opening in the cornea with such ease as it ought to do.

In this situation, it is the common practice to force out the lens by repeated applications of pressure. This, however, ought never to be done ; for nothing proves more destructive to the eye than violence applied to it in this manner : for besides the loss of the vitreous humour with which it is commonly attended, the iris is often materially hurt, and much inflammation induced by it.

When the lens cannot be easily removed from the anterior chamber of the eye by means of a scoop, and in every instance where it is with difficulty forced through the pupil, the operator, instead of persisting to employ much pressure, should rather enlarge the opening in the cornea, using for this purpose small probe pointed scissors ; and this being done, the operation falls to be finished in the manner I have already advised.

With a view to render the passage of the lens as easy as possible, the pupil should at this part of the operation be in the state of the most perfect dilatation ; for which purpose, after the incision of the cornea, and the opening of the capsule of the crystalline are completed, a dark cloth or curtain may be placed between the eye and the light, to be removed on the lens passing out ; or the patient may be placed with his back to the window.

In a few instances of cataract, the cause of opacity is not found in the lens itself, but in its capsule : in this case, the extraction of the lens answers no good purpose, as the opacity is equally strong after the op-

eration as it was before. Some authors have therefore in such circumstances advised the opaque capsule to be removed with forceps and other instruments passed through the pupil ; but this can never be done but with much risk of destroying the iris, and doing much injury to other parts of the eye : it ought never therefore in my opinion to be attempted : we should rather trust to time, and an antiphlogistic regimen, for the removal of the opacity ; from which no harm can ensue, and I have known instances of cures being performed by it : whereas the forcible extraction of the opaque capsule, so far as I have yet heard, has never in any case effected a cure ; and it has frequently destroyed the eye entirely.

When, again, the operation is to be performed upon the right eye, if the surgeon wishes to do it in the usual way with the knife commonly employed, he must use his left hand ; but as few practitioners are able to perform this nice operation with the left hand with sufficient steadiness, I have delineated a knife, fig. 2. Plate XVI. by which it may be easily done with the right hand, while the patient and surgeon are sitting opposite to each other in the manner I have mentioned : only, in this case, the point of the knife, must be entered at the internal canthus of the eye, and must then be pushed out to the opposite side, instead of being introduced at the external angle, and carried towards the nose.

The operation being finished, the eye should be immediately covered with a compress of soft lint, or old linen, soaked in a weak saturnine solution, to be retained by the bandage, fig. 3. Plate XXX. or any other that does not compress the head much, or keep it too warm. For several days after the operation, no light should be admitted to the patient's apartment. A very low diet should be advised : and the eye being very apt to inflame, repeated bloodlettings are frequently requisite from the jugular vein or temporal artery.

As this operation indeed is more apt to fail by the subsequent inflammation of the eye than from any other cause, it requires our utmost attention to guard against it : and as the healing of the incision depends in a great measure on the eye being kept at rest, every cause of irritation should be avoided. When the operation succeeds, the incision is in general cured in fourteen or fifteen days ; but in some instances it continues open for several weeks.

In describing the operation, I have noticed an occurrence that is apt to happen, when every part of it is not done with caution, and which commonly proves very alarming ; namely, the loss of a considerable part, or perhaps the whole, of the vitreous humour. By this the eye becomes flat, and instantly sinks within the orbit : but although it ought to be guarded against with the nicest attention, it does not always prevent the success of the operation. I have known indeed some instances of the eye remaining sunk and useless after this accident, but most frequently the globe begins soon to fill again, and in the course of two or three weeks it has commonly acquired its usual bulk.

Whether this takes place from a regeneration of the vitreous humour, or merely from the ball of the eye being all filled with an aqueous secretion, I will not pretend to say. The latter is the common opinion ; but why may not the vitreous humour be renewed as readily as the other ? I am inclined to think that a renewal of the one happens as readily as that of the other, from having often observed as perfect a state of vision after this operation, where all the vitreous humour had been lost, as if none of it had been discharged ; of which a remarkable instance occurred in a woman who some time ago had the operation performed upon both eyes. The eyes were otherwise both apparently sound : in one, the whole of the vitreous humour was forced out along with the cataract, and the eye sunk entirely to the bottom of the orbit ; in the other, the operation was performed with much

accuracy ; the cataract was extracted, and none of the vitreous humour escaped. In the course of three or four weeks, however, from the operation, both eyes were of the same bulk ; their appearance was perfectly similar, and the patient discovered objects equally well with each of them. This does not indeed determine the point with certainty, as it may be alleged, that the figure of the eye being preserved by the aqueous humour, the effect produced upon vision by the loss of the vitreous humour cannot probably be great ; but we can scarcely suppose that any part of such an important organ has been formed in vain.

I shall now offer a few observations on the instruments employed in this operation. Knives of various forms have been proposed for it ; but those delineated in Plate XVI. have been most generally used ; and of these fig. 1. and 3. are the best : the first I have used successfully in various instances ; and the latter, which I now believe to be the best that has yet been proposed, is the knife of the ingenious Dr. Richter of Göttingen. The shape of the first is nearly that of a spear pointed lancet ; only the back of it is blunt, excepting a fourth part of an inch or thereby near the point, which should be sharp on both edges ; and that side of the knife which passes next the iris should be somewhat round, while the other is nearly or altogether flat. By this we prevent, as much as possible, any risk of hurting the iris, which is apt to happen with a knife that is flat on both sides, and with both edges sharp through its whole length. The operation has frequently indeed been performed with this kind of knife, but it is done with more safety with the one I have mentioned. We ought however to take care, that while a knife for this purpose should be extremely sharp and finely polished, it ought likewise to be firm ; for the cornea being both thick and firm, it is more difficult to pierce than those who are not accustomed to this operation are apt to imagine, and who

are therefore disappointed at finding the instrument in ordinary use too fine. It should be at least as firm as a common lancet.

For the purpose of opening the capsule of the lens, nothing answers better than the flat curved probe delineated in Plate XVIII. fig. 5. The instrument commonly used for this is represented in Plate XXIV. fig. 2. but we incur with it a greater hazard of hurting the iris. But whatever instrument is employed, it should be passed through the pupil with much steadiness, otherwise the iris may be readily injured, of whatever form it may be.

I have thus described all the steps of the operation as it is now practised, with such improvements as it appears to admit of: but as it is an operation of much importance, and liable to different objections, even in its present improved state, I have been led to consider it with more than ordinary attention, and to make experiments upon different animals with a view to obviate these; the result of which I shall now shortly relate, although I did not think it proper either to place any weight on them, or even to mention them in the description of the operation; for, till confirmed by experience upon the human body, no conjecture, however well founded it may appear to be from experiments on other animals, should be allowed to have much influence on our opinion.

The most material objections that occur to this operation are these: the vitreous humour is apt to pass suddenly off along with the cataract; by which the eye is in some instances sunk so much as never to recover its form again: the incision being made in the transparent part of the eye, the cicatrix which ensues is frequently so extensive as to obstruct the rays of light in their passage to the retina; by which vision is often as effectually obscured, as if the cataract had not been extracted: and lastly, the lens being often too large for passing through the pupil, the iris is frequent-

ly much injured by this part of the operation, when in every other respect it is perhaps very properly performed.

In regard to the first of these, it may be alleged, that it does not occur when the operation is properly done ; and that it cannot with propriety be stated as an objection, merely because it frequently happens from awkwardness or inattention in the operator. It is, however, so frequent, that whatever can tend to prevent it, must be considered as a very material improvement.

This, I think, may be in some measure done, by the incision being made in a different part of the cornea. When the opening in the cornea is made, as in the usual way of performing this operation, in the most depending part of it, all the aqueous humour is instantly discharged, by which the vitreous humour is deprived of support at its anterior surface ; so that any pressure made upon the ball of the eye by the speculum, or even by the natural action of the muscles of the eye, is very apt to force it out. Instead of this, by making the cut in the upper part of the cornea, the lens may be extracted with equal ease, while a considerable part of the aqueous humour being still retained by the inferior half of the cornea remaining entire, the vitreous humour is neither so suddenly nor so entirely deprived of the support which it affords, and does not escape so readily as in the ordinary method of performing the operation. At least, this I have found to happen in other animals ; and there is reason to imagine that it will likewise be the case when the operation is done on the human eye.

It is also probable, that another advantage may be derived from the incision being made in the upper part of the cornea. One material objection to this operation, when done in the usual way, arises, as I have already observed, from the cicatrix induced by the incision on the cornea. The same extent of the cornea will no doubt be cut, when the operation is perform-

ed in the manner I have mentioned ; but the cicatrix being in the upper part of the eye, it will not probably prove so hurtful, as it is of most importance for objects to be seen distinctly that lie beneath the eye. We frequently find that patients who have undergone this operation, see every object more distinctly, when placed above the eye, than when viewed beneath it ; a circumstance that cannot in any other manner be so well explained.

The upper part of the cornea is cut with the same ease as the under part of it ; the same instruments being employed, and the surgeon, patient, and assistants, being placed in the same manner : only in this case the knife must be introduced with the cutting edge of it towards the upper part of the eye, the incision being to be extended in this direction : and as the under half of the cornea remains undivided, the lens, on passing through the pupil, being apt to be retained by the flap, must be cautiously removed, either with the scoop, Plate XVI. fig. 4 ; with a small sharp hook, Plate XVIII. fig. 2, or with the small forceps, fig. 4, which were made for this purpose when I was engaged in the experiments that I have mentioned.

In this manner the two first objections to this operation are in some measure removed ; and from all the observations that I was able to make of it in the course of the experiments to which I allude, I think it probable that it will answer in every respect better than any other that has yet been proposed ; but as I have never put it in practice in the human eye, I cannot speak of it with decision ; and I propose it only as a hint for future observation.

But although we may by this means prevent the escape of the vitreous humour, and may in some measure avoid the bad effects that usually result from the cicatrix after this operation, yet the third objection remains in equal force against it ; the cataract must necessarily pass through the pupil, and in doing so the iris is often irreparably hurt.

As this renders the operation much more hazardous than it otherwise would be, it has always appeared to me that it would be a very important improvement of this operation, to extract the cataract in any other manner that would not expose the iris to this hazard. This we may do by opening the eye behind the iris, instead of making the incision in the usual place in the lucid cornea ; and it would be attended with this advantage, that no inconvenience would ensue from the cicatrix. In this manner I have frequently performed the operation on other animals ; but it has never, so far as I know, been put in practice on the human eye. The objections which occur to it are, that the opening being made in the sclerotica, the inflammation induced by it must probably be great ; and this coat of the eye being thicker than the transparent cornea, wounds made in it are commonly supposed to be more difficult to heal. In some experiments, however, which I made upon rabbits, with a view to determine this point, no reason appeared for this conclusion. The inflammation induced by an opening made in the sclerotica was not more considerable ; nor was the cure in any respect more difficult than when the operation was done in the usual manner.

If the operation is ever performed in this manner, the opening should be made in the upper part of the eye, by entering the point of the knife about the tenth part of an inch or thereby behind the transparent cornea ; and the incision being made of a sufficient size for allowing the cataract to pass, the sharp hook, fig. 2. Plate XVIII. should be introduced, with a view to extract it. As the point of the instrument is extremely sharp and fine, it penetrates the lens with ease, and in this manner it may be removed without making any pressure on the eye.

Having thus finished the consideration of the two operations of couching and extracting the cataract, before concluding the subject, I shall offer a few obser-

vations on the comparative advantages that result from them ; and shall at the same time, mention those reasons by which I have been induced to prefer the one to the other.

§ 4. *Comparative View of the respective Advantages and Disadvantages of the Operations of Couching, and extracting the Cataract.*

THE operation of couching, or depressing the lens, was the first that was practised for the cure of the cataract. The extraction of the lens was afterwards proposed, as a more certain means of removing the disease. Both methods have had their abettors, and much has been said in favour of each. To appreciate therefore the merits of these operations, and to ascertain that by which our intention may be accomplished in the safest and easiest manner, are objects meriting particular attention.

It has been objected to the operation of couching, 1. That it frequently fails from the cataract rising again into its usual situation. 2. That it must always fail when the lens is in a soft or liquid state, by the fluid contained in the capsule dispersing through the eye when the capsule is opened by the couching needle. And, lastly, when the opacity lies in the capsule, and not in the lens, that it cannot be cured by couching.

With regard to the first of these, it must be acknowledged, that the cataract frequently rises again after having been depressed to the bottom of the eye : but when the lens, instead of being pushed down immediately behind the iris, is carried, as I have directed, by the point of the needle towards one angle of the eye, and lodged partly beneath the vitreous humour, it never rises again ; and even where the operation fails through the fault of the surgeon, or from any other cause, the pain attending it is so inconsiderable, that few patients will refuse to have it repeated

once or oftner ; and I have seldom known it fail, where this has been done.

The second objection may appear of more importance to those who are not accustomed to this operation, but it is not so in reality. A cataract in a fluid state, and spreading over the eye immediately on the capsule being pierced with the needle, is not a common occurrence ; from my own observation I would say, that it ~~does~~ not happen more than once in twenty times : but were we even to meet with it more frequently, so far from stating it as an objection to the operation, we should rather consider it as an advantage. In this case the violence done to the eye is not so great as when the operation of couching becomes necessary in all its parts from the cataract being of a firm consistence ; a repetition of the operation can never be requisite ; and the milky whiteness communicated to the aqueous humour by the dispersion of the liquid crystalline through it, commonly disappears in a short time after the operation. At least that it commonly does so, is consistent with my own experience ; and the observation is confirmed by the testimony of others, particularly by that of the late Mr. Pott, on whose authority we may rely with confidence.

Nay, further, even when the cataract is firm and entire, if completely separated from its capsule by the couching needle, it almost always dissolves in the aqueous humour, without leaving any vestige of opacity ; an observation much in favour of the operation of couching, as it obviates the objection founded on the rising of the cataract after it has been depressed : it shews, at the same time, that there is little or perhaps no reason for ever putting in practice the proposal of Mr. Petit, for removing a cataract which in couching may have been accidentally pushed into the anterior chamber of the eye, as time will, in most instances, accomplish without pain or hazard what cannot be done by Mr. Petit's method but at the expence of both.

The lens appears to dissolve in the aqueous humour sooner or later, according as it is more or less firm when separated from its capsule. The opacity produced by the dispersion of a fluid lens in the aqueous humour, commonly disappears soon after the operation: cataracts of a firmer consistence are seldom altogether dissolved in less than several weeks; in many a small portion of a depressed cataract is observed in an undissolved state a good many months after the operation, and in a few after several years have elapsed; but this is a rare occurrence.

The third objection, of which I took notice, the alleged impossibility of removing the disease by couching when the cause of the opacity lies in the capsule, and not in the lens, seems *à priori* to be the most conclusive against this operation; but it will not on examination be found to be so. In the first place, this variety of cataract is rarely met with: it occurs occasionally, but by no means so frequently as to lead us to prefer one mode of operating to another for this reason alone.

Secondly, I have already observed, that this variety of cataract cannot be cured even by extraction. The opaque capsule may indeed be forcibly torn away with instruments passed through the pupil, but not without doing such violence to the eye, as must in a great proportion of cases, probably in every instance, be productive of certain blindness. I may therefore, without hesitation predict, that although this operation may be performed from time to time by those who are fond of innovation, and who wish to shew their dexterity at the expence of those intrusted to their care, that it will never be generally practised. I have seen it done by some of our most expert oculists, but in every instance the eye was completely destroyed by it, while the inflammation which it served to excite never failed to prove uncommonly severe.

Besides, although I will not say that this variety of cataract can in every instance be removed by couching, yet an attempt towards it may be made with perfect safety, by endeavouring to separate and depress the capsule with the point of the needle. If this can be done, the operation will prove as successful as if no such cause of disease had subsisted : and when it happens to fail, provided the trial is made with caution, no detriment will ensue.

Besides these objections, it has been said, in opposition to the operation of couching, that the pain and inflammation that attend it, are frequently greater than what arise from extraction ; and that the vitreous humour is more apt to be deranged by the needle in couching, than by the other method of operating.

But neither of these assertions will be admitted by those who have had sufficient opportunities of putting both operations in practice. They know, that in general the symptoms of pain and inflammation arising from the extraction of the cataract are more considerable than those that proceed from couching ; and it must be acknowledged by all who speak impartially, that the operation of extraction is frequently attended with the loss of some part, or perhaps of the whole of the vitreous humour, whilst that of couching can produce no material derangement.

We have thus seen, that the several objections stated to the operation of couching are not well founded : that the cataract can be removed by it as effectually as by the operation of extraction : that it is attended with less pain, and less subsequent inflammation ; while at the same time, it never can occasion those deformities that arise from a large cicatrix on the cornea, or from the sinking of the eyeball, which sometimes occurs from the loss of the vitreous humour.

But these circumstances alone should not be allowed to decide a question of such importance : the ultimate and permanent effects of the two operations ought alone to have weight on our opinion. Now,

from much observation, it appears clearly to me, that the operation of couching proves upon the whole more successful than the other ; that is, vision is as perfectly restored by couching, and *cæteris paribus*, a greater proportion of those who submit to it receive benefit from it, than of those who undergo the operation of extraction.

With those who have not had frequent opportunities of observing the consequences of extraction, it proves always a very deceiving operation. The removal of the cataract is in most instances attended with an immediate return of vision, much to the satisfaction of both the patient and operator ; but, in a great proportion of cases, even of those which at first have every appearance of proving successful, although vision may be tolerably perfect for some time, perhaps for several weeks, or even for months ; yet it generally grows more indistinct, till at last the patients become altogether blind. This is the result of my observation ; and it corresponds with the event of the operation when performed by various good operators.

The late Dr. Young of this place, who practised surgery for a considerable time with much reputation, had at one period a very high opinion of this operation. In the second volume of the *Edinburgh Physical Essays*, he gave an account of his success in six cases in which he had operated a few months before, and which, at the time of writing the paper, appeared to be remarkably great : but in a conversation with the Doctor on this subject a good many years afterwards, I found his opinion much changed. The Doctor's observations on the consequences of extraction were exactly similar to those that I had made on it. In the greater number of patients upon whom he had operated, vision was restored immediately on the removal of the cataract ; but in nearly the whole of them the sight began to be impaired in a few months from the operation, and became gradually worse, till total blindness at last was produced.

The progress of the loss of that degree of vision which is restored by the extraction of the cataract, is marked by the following appearances. Some degree of immobility is at first observed in the pupil : it remains inactive when the eye is exposed to light : it gradually becomes smaller ; and at last it is found to be so much contracted, as scarcely to appear capable of admitting a crow's quill : it now remains immovable to whatever light it may be exposed, and the patient is often reduced to a worse state than he was in before the operation, being even incapable of distinguishing light from darkness.

This unfavourable event appears to proceed from the violence, which, in the course of the operation, is done to the iris ; which is well known to be a membrane of the most delicate texture ; and as the pupil through which the cataract is forced is never sufficiently large for admitting the lens to pass with ease, it accordingly is seldom extracted but with injury to this very nice and useful part of the eye.

It may be said, that the violence thus done to the iris should produce an immediate effect ; and that vision, if not hurt by it at first, should not afterwards be affected. In various cases, the iris is torn in different places, and appears to be irregular in its contraction and dilatation from the time of the operation being performed : but although in these, as well as in other instances where the pupil is only overstretched, blindness does not take place immediately ; yet it is almost as certainly to follow, as if it had been instantly produced. The reason of this it is perhaps impossible to explain ; but in the course of my observation, the fact has been exactly what I have mentioned.

Proceeding upon the idea of the failure of this operation depending in a great measure upon the injury done to the iris by the passage of the cataract, and being anxious to improve an operation for which at one time I had a great partiality, I have offered a proposal for this purpose. By making the opening in

the eye behind the iris, in the manner I have proposed, this inconvenience may be avoided ; but whether this mode of operating will be found to succeed or not, future experience alone must determine.

In the mean time, till the operation of extraction is so far improved as to obviate the bad effects that I have pointed out, the method of cure by depression I shall continue to prefer, as being more easily performed ; less apt to injure the other parts of the eye ; and in most instances productive of more real advantage.

SECTION XVIII.

Of the Fistula Lachrymalis.

A SINUOUS ulcer, with hard or callous edges, is in general termed a fistula ; but authors, in treating of diseases of the lachrymal passages, have affixed a different meaning to this term : every obstruction to the passage of the tears from the eye to the nose, is commonly, though improperly, denominated a fistula lachrymalis. A sinus in these parts, attended with callosity, ought alone to receive this appellation ; but as some confusion might arise from any innovation that could be proposed, I shall avoid, as I have hitherto done, any attempt towards it ; and shall endeavour to describe, as clearly as possible, the various appearances which the disease in its different stages is known to assume, under the general denomination of fistula lachrymalis.

An anatomical description of the eye having already been given in the second Section of this Chapter, I shall now refer to what was then said of the parts concerned in the disease that we are now to consider. An accurate delineation is likewise given of these parts in Plate XII. fig. 1. ; *b* represents the puncta of the two lachrymal ducts, by which the tears are carried from

the eye to the *fac e* ; from whence they are transmitted by a canal which passes in an oblique direction through the *os unguis* into the nose, where it terminates below the *os spongiosum inferius*. I formerly remarked, that the *os unguis* is divided longitudinally by a kind of ridge, which at this part forms the boundary of the orbit ; and it is necessary to observe, that the groove in this bone, through which the nasal duct of the lachrymal sac runs, lies altogether exterior to the orbit, being separated from it by this ridge of the *os unguis*.

This short recapitulation of the anatomy of the lachrymal passages, will render the description now to be given of the diseases to which they are liable more intelligible.

The fistula lachrymalis arises, as I have already observed, from obstruction to the passage of the tears into the nose ; but the disease assumes a variety of appearances, according to the seat of the obstruction, and to the effects which it excites on the neighbouring parts. Thus we may readily suppose, that the symptoms produced by obstruction in the puncta lachrymalia, or in the ducts leading from these to the sac, will be widely different from those which arise from obstruction in the lachrymal sac itself, or in the duct leading from this sac to the nose. And again, we might *à priori*, conclude, that the appearances induced by a recent obstruction of any of these passages, must probably be very different from those which take place after a long continuation of the disease.

The lachrymal puncta and ducts are apt to be obstructed by burns, wounds, or whatever excites inflammation in any part of them, and when the tears are thus prevented from passing into the nose, they necessarily fall over the cheek, and where they do not become acrid, so as to excoriate or fret the neighbouring parts, this discharge of tears is almost the only symptom which this variety of the disease ever excites : a dryness indeed takes place in the corresponding nos-

tril, by the want of this secretion which used to be poured into it ; but this inconvenience is never of much importance.

It is this variety of the disease only which ought to be termed epiphora, or a watery or weeping eye ; for when the obstruction is seated in any other part of the lachrymal passages, the disease that ensues is attended with very different symptoms.

When the lachrymal puncta and ducts remain open, if obstruction takes place either in the under part of the lachrymal sac, or in the duct that leads from it to the nose, the first warning that the patient receives of it is a small tumor that forms in the internal canthus of the eye, that disappears on being compressed, by a plentiful flow of tears passing into the eye, and from thence over the cheek. In this incipient state of the disease, some portion of the tears frequently passes into the nose on the sac being compressed ; a circumstance always to be considered as favourable, as it shows that the obstruction is not altogether complete.

If the tears are regularly pressed out before the tumor becomes large, and before they have remained in the sac so long as to become acrid, they are usually clear, and of a natural appearance when forced out from the puncta ; and, from the resemblance which this fluid bears to the contents of hydropic collections in other parts of the body, this stage of the disease has been termed a dropsey of the lachrymal sac ; a distinction, however, of no real importance.

When in this state of the obstruction the patient is attentive to a proper and frequent application of pressure, and does not allow the lachrymal sac to be over distended, a complete cure may either be obtained, or the disease prevented from giving much uneasiness ; at least this is always the case so long as the tears retain their natural appearance, and while a considerable proportion of the contents of the tumor can be pressed into the nose.

It most frequently happens, however, from the patient being inattentive to the state of the sac, and allowing it to be over distended, that this most simple state of the disease proceeds in a gradual manner to turn worse: the passage into the nose becomes completely obstructed: the swelling in the corner of the eye acquires a greater bulk, but still retains the natural appearance of the skin: the tears are now with difficulty pressed out, and are observed not to be transparent, but mixed with a proportion of a thick, opaque, whey coloured mucus, somewhat similar to, but when minutely examined found to differ considerably from, purulent matter.

Even in this stage of the disease the patient seldom suffers much pain, or any farther inconvenience than that which results from the flowing of the tears and mucus over the cheek: at last, however, the tumor begins to inflame, to become tense, red, and painful to the touch; and the matter pressed out from it has now a more purulent appearance.

At this period the tumor is exactly similar to a common boil or abscess; and by those not versant in this branch of practice, it is frequently considered as such. It becomes gradually more inflamed and more tense, till the teguments at last burst, and form an opening in the most prominent part of it, at which the tears and matter contained in it are now altogether discharged.

When the opening thus formed is small, it commonly heals in the course of a few days; but it bursts again as soon as any considerable quantity of tears and mucus is collected; and continues thus to collect and burst alternately, till the opening becomes sufficiently large to prevent any farther collection from taking place.

This state of the disease exhibits exactly the appearances of a sinuous ulcer, with callous, and sometimes with retorted, edges, constituting what is properly termed the fistula lachrymalis. Tears, mucus, and

purulent matter, are now abundantly discharged from the fore. When the bone beneath is found, this discharge is seldom either acrid or offensive to the smell; for the opening being in general in the under part of the tumor, the matter is discharged almost as speedily as it is formed; but when any of the contiguous bones are carious, they are not only found to be so by the introduction of a probe, but by the appearance, smell, and effects of the matter upon the neighbouring parts. In this case, it is thin, fetid, and commonly so acrid as to fret and corrode the teguments most contiguous to the ulcer: and when the disease is connected either with scrofula or lues venerea, an occurrence by no means unfrequent, the discharge and appearances of the fore are different according as it happens to be combined with one or other of these diseases.

I have thus described the different symptoms of this disease, and the progress which it usually makes from the first formation of obstruction in the lachrymal passages, to its last or ultimate stage; and it is highly necessary that practitioners should be acquainted with the different appearances which the various states of it afford; for the method of cure best suited to one period of the disease, is frequently unfit for, and indeed altogether inadmissible in others.

From the history that I have given of the rise and progress of this disease, it is evident, that in every instance it originates from obstruction in some part of the lachrymal passages: the cure must therefore depend upon the removal of this obstruction; but the means of effecting this will vary according to the nature of the cause by which it is produced, and to the particular stage of the affection, as well as of the part in which it is seated: our prognosis must likewise be directed by attention to these points; for we may readily conceive, that a cure will be more easily and more certainly obtained in the case of a recent obstruction, where the bones are yet perfectly sound, and where there is no suspicion either of scrofula or lues

venerea, than in opposite circumstances. When the obstruction is induced by the venereal disease or by scrofula, and especially when the os unguis and other contiguous bones have become carious, nothing will answer the purpose till the general taint of the constitution is removed; and even then a weeping eye or a frequent flow of tears over the cheek very commonly ensues, and can never in future be removed. But when the fistula lachrymalis arises, as it most frequently does, from inflammation of the lachrymal passages, induced either by cold, by the measles, or any inflammatory affection to which the eyes are liable, if it has not continued so long as to hurt the bones beneath, we may in general give a favourable prognosis: for in such circumstances, a due perseverance in the means to be now pointed out, though not always, is yet very commonly attended with an entire removal of the disease.

Again, when obstructions are induced in the lachrymal canals by tumors in the contiguous parts, which they sometimes are, particularly in cases of polypi in the nose, where the tumor by pressing upon the inferior extremity of the nasal duct is apt to produce a stoppage to the flow of tears, the prognosis must in a great measure depend on the practicability of removing the excrescence; for till this is accomplished, nothing effectual can be done in the treatment of the fistula lachrymalis.

The lachrymal sac and ducts are lined with a mucous membrane, similar to the membrane that lines the nose; with which it is connected, and of which indeed it appears to be a continuation. In a healthy state of these parts, the nasal duct of the lachrymal sac will easily admit a crow's quill; a size perfectly sufficient for allowing a free passage of the tears into the nose: but when this membrane that lines the duct becomes inflamed, as the fulness which this excites must diminish the diameter of the canal, obstruc-

tion proportioned to the violence of the inflammation must necessarily ensue.

I particularly mention the nasal duct, as it is in this duct that the obstruction producing the most frequent variety of the disease is seated, owing to its near contiguity to the nose; by which, in cases of catarrh, inflammation is apt to be communicated to it from the membrane of the nose: but obstruction to the flow of tears into the nose will just as certainly take place from inflammation seated in the ducts leading from the eye to the lachrymal sac; and the principles upon which the method of cure proceeds must be nearly the same in both.

When the disease proceeds from inflammation, we should depend chiefly on such remedies as prove most effectual in inflammatory affections of other parts of the body. General and local bloodletting should be prescribed in quantities proportioned to the strength of the patient, together with laxatives and a low diet; and a saturnine solution should be applied to the part affected, either in the form of a poultice, or with compresses of soft linen. In this manner, when the means are timely employed, and duly pursued, obstructions arising from this cause are frequently removed; but when the parts have been long in an inflamed state before any remedies were used, it often happens that a cure cannot afterwards be accomplished even by the most complete removal of the inflammation: for, as inflamed parts, when kept long in contact, are every where apt to adhere, so the sides of the lachrymal passages, when much inflamed, very readily unite together; by which a very obstinate variety of the disease is produced; and which shews, in a strong point of view, the propriety of treating every affection of this kind with the utmost attention from the beginning: by which we frequently have it in our power to prevent the formation of this obstruction, and which nothing but a painful operation can afterwards remove.

When the obstruction is seated in the puncta lachrymalia, or in the ducts leading from these to the sac, and when it is found to continue after the inflammation which gave rise to it is removed, we sometimes succeed in removing it by inserting a small probe into each punctum, so as to pass it along the course of the ducts into the lachrymal sac. In this manner the opening may be rendered pervious, and be afterwards preserved by injecting, twice or thrice daily with a small syringe, a weak solution of alum, saccharum saturni, or white vitriol; and by keeping at other times small silver or leaden probes constantly inserted, till the sides of the ducts become callous, the tears will thus find a free passage to the sac, by which a cure will be obtained.

This is no doubt a very nice operation; but whoever is versant in the anatomy of these parts, and accurately acquainted with the course of the lachrymal ducts, may, in the course of a few trials, be easily able to perform it. The probes represented in Plate XXI. figs. 5. and 6. and the syringe and small tubes in Plate XX. figs. 1. 5. and 7. are the instruments to be employed for it.

In obstructions of these ducts, it has been likewise proposed to pass a small cord or seton from the puncta through the lachrymal sac into the nose, and to allow it to remain till the passage becomes callous. But, besides the difficulty of effecting this, there is much reason to think that it would do more harm than good, as the smallest cord that we could pass would create much inflammation and pain.

The obstruction, however, is most frequently seated in the duct leading from the sac to the nose, forming a variety of the disease that requires a more complex method of treatment. When induced by inflammation, a strict antiphlogistic course, such as I have mentioned, will frequently remove it; but when this happens to fail, either from the disease having been improperly treated from the first, or from any other

cause, other means should be employed. I shall therefore suppose, that all symptoms of inflammation are removed; but that the nasal duct still remains obstructed; that it is attended with a slight tumefaction in the internal canthus of the eye, along with a frequent flow or discharge of tears over the cheek; and that the skin covering the tumor still retains its natural appearance.

This is the most simple stage of the disease. It is neither attended with pain nor with much deformity or inconvenience; and with a moderate share of attention on the part of the patient, the aid of a surgical operation may be rendered unnecessary: by compressing the lachrymal sac from time to time with the finger, the contents of it are discharged before they become acrid; and although this does not accomplish a cure, it in general renders the disease very supportable; so that in this stage of it, so far as I can determine from my own experience, nothing further should be attempted. Various means have indeed been proposed for effecting a complete cure of this stage of the disease, but being all tedious and painful, and not by any means certain, as long as a watery or weeping eye is the only inconvenience that occurs from it, a prudent practitioner will rather advise a patient to submit to this, than undergo the pain, confinement, and uncertainty, of a nice operation. As a fresh attack of inflammation would be apt to render the disease worse, he will advise him to avoid exposure to cold, and whatever might tend to induce an inflamed state of the eye and neighbouring parts; and, in the mean time, he will desire him to trust to gentle pressure alone for obviating any effects that might ensue from the obstruction.

For the purpose of applying pressure to the lachrymal sac, various machines have been invented; the most convenient form of which is represented in Plate XIX fig. 1. by which any necessary degree of compression may be continued with ease and without interrup-

tion. But, as we are now supposing that the nasal duct of the lachrymal sac is completely obstructed, and that no part of the tears can be forced into the nose, no benefit can be derived from a continued course of pressure; and as any advantage to be obtained from the practice is found to accrue with equal certainty from the finger being applied from time to time on the course of the sac, I have always, in this stage of the disease, been accustomed to depend upon this alone.

The other means that have been recommended for the cure of this stage of the fistula lachrymalis, are, the introduction of a probe into the nasal duct of the lachrymal sac, with a view to remove the obstruction: the injecting of water, or any other mild liquid, for the same purpose: and, lastly, it has been proposed to introduce a quantity of quicksilver into the sac, through the lachrymal puncta, the weight and fluidity of which being supposed well fitted for making it pass through any ordinary degree of obstruction.

Mr. Anel, a French practitioner, was the first who brought to perfection the method of introducing a probe, or the point of a syringe, into the lachrymal sac: but although an accurate knowledge of the anatomy of these parts may enable any one to perform it in a sound or pervious state of the lachrymal passages, yet in an obstructed state of the nasal duct it can scarcely be done; and, even when affected, it is not found that so much benefit is derived from it as at first there might be reason to expect.

Two modes are proposed for effecting this operation: in the one, a small probe, or tube of a syringe, is inserted at one of the lachrymal puncta; and being insinuated along the course of the corresponding duct, it is in this manner passed into the sac, and from thence we are directed to carry it through the nasal duct into the nose: or, when this cannot be fully accomplished, we are desired to force an opening through this duct by an injection thrown in with a syringe in-

ferted at one of the puncta. The syringe above mentioned, with the small corresponding tubes, as delineated in Plate XX. is the instrument recommended for this purpose. By the other mode of doing the operation, a curved probe, or tube, of a larger size, such as is delineated in fig. 4, of the same Plate, is to be insinuated into the nostril of the diseased side; and the point of it being passed beneath the edge of the os spongiosum inferius, it is there to be easily moved about till it meets with the termination of the nasal duct of the lachrymal sac, from whence it is cautiously carried forward till it passes into the sac itself.

Different objections, however, occur to these operations. The puncta lachrymalia are so very small, that no probe or syringe can be passed through them of a sufficient size for removing any obstruction in the nasal duct. And although a syringe of a larger size may in a state of health be introduced through the nostril directly into the nasal duct itself, in a diseased state of these parts, it can seldom or never be done. In obstructions of this duct, as they very commonly arise from inflammation communicated from the membrane of the nostrils, the disease often commences in the extremity or termination of the canal; so that it is always difficult and often impossible to introduce a probe or syringe into it; and if the operator is even so fortunate as to accomplish this, it always requires some violence to force it into the lachrymal sac. Hence a good deal of pain is excited, by which the duct and sac are both apt to become inflamed: so that, instead of any advantage being derived from the practice, much mischief is apt to ensue from it.

The proposal of curing this disease by injections, is very ingenious; but, for the reasons I have given, it will seldom, I imagine, be of much real utility. We are indeed told, that it will often answer in cases of slight obstruction; and that all the pain and uncertainty of the ordinary means of cure may thus be avoided. But when the obstruction is completely formed,

it is altogether inadmissible, from the impossibility of introducing a probe; and whenever the stoppage of tears is only partial, there will be much risk of doing more harm than good, by the irritation, pain, and consequent inflammation, which the operation never fails to produce. In such circumstances, the patient should rather submit to any inconvenience arising from the disease, than to uncertain trials of this kind.

For the same reasons that the passing of a probe, and of injections, into the lachrymal passages, can seldom if ever prove useful, the introduction of quicksilver into the lachrymal sac will likewise probably fail: where obstruction is already formed, it will not be able to remove it; and unless obstruction takes place, no attempt of this kind is indicated. The practice, however, is ingenious; and as it may be done with more ease, so it is less exceptionable than the use of probes or injections.

In the early stages of the obstruction, I have frequently passed injections from the puncta lachrymalia into the nose; but although this proved always satisfactory at the time, it has not been attended with any real advantage; for although I have now done it in upwards of fifty instances, and in many of these liquids were daily passed along the lachrymal passages for several weeks together, yet in none has the disease been removed by it. The liquids that I employ, are warm water, rose water, and weak solutions of saccharum saturni.

I have thus described the modes of treatment to be advised in the most simple stage of the disease; but I must again observe, that as long as a watery or weeping eye, with perhaps a slight occasional tumefaction in the internal canthus, is the only inconvenience that it excites, nothing should be advised but the application of moderate pressure from time to time with the finger.

But whenever the disease arrives at such a height as to produce either much pain or deformity, a different

treatment is required. When the tumor in the angle of the eye becomes large, inflamed, and painful, as the collected matter soon turns sharp and acrid, the contiguous bones are apt to be injured, if the matter is not quickly discharged.

In such circumstances, a person not acquainted with the anatomy of the diseased parts, and with the cause of the tumor, would be induced to trust entirely to an opening being made in it sufficient for discharging the matter: for in this state of the disease, it assumes exactly the appearance of a common boil or abscess; and therefore this method of treatment might be considered as sufficient. But although some temporary advantage might thus be derived from the discharge of the matter, as the cause of the tumor would not be removed, a permanent cure it is evident would not ensue. We are here supposing that the disease originates from obstruction in the nasal duct leading from the lachrymal sac. It is clear, therefore, that the sac only being laid open, will be attended with no further benefit than that of producing an immediate discharge of its contents; for while the tears are conveyed into it by the puncta and lachrymal ducts, if they do not find a free passage into the nose, they must necessarily be either discharged by the opening newly formed, or, if this is allowed to heal, they will again collect and produce a tumor similar to the first.

In this situation, therefore, our views must be, to discharge the contents of the swelling; to procure a free exit in future for the tears from the lachrymal sac into the nose, and to prevent the duct from being again obliterated. And this being accomplished, the external opening must be healed.

While the tumor continues firm, it ought not to be opened, as this would not only excite more pain, but the parts beneath could not be so freely examined as they otherwise might be. As long, therefore, as the tumor is hard, a warm emollient poultice should be

kept applied to it; and as soon as it becomes soft and compressible, it may be opened with freedom. On account of the contiguity of the eye, and of the insertion of the orbicularis muscle, to make an incision into the lachrymal sac has in general been considered as a nice and hazardous operation, and particular directions have been given, not only for the figure and size of the incision, but for discovering the exact site of the sac.

There is no cause, however, for anxiety upon this point; for the situation of the sac is always ascertained with precision by the tumor itself; which is formed, as I have already observed, by tears and mucus collected in the sac; so that any incision that discharges this collection must for certain reach the sac. Neither does the form of the opening make much difference in the hazard attending the operation. A semilunar cut has commonly been recommended; not only with a view to render the opening larger, but in order, as it is said, to avoid with certainty the tendon of the orbicularis muscle. There is no risk, however, of this tendon being injured if the incision is made where it ought to be, namely, in the most prominent and most depending part of the tumor; and it is easier done with a common lancet than with any other instrument. The point of the lancet should be entered at the upper part of the tumor, pushed freely into the sac, and carried downwards in a straight direction to the most depending part of it. A few fibres of the orbicularis muscle which are inserted into and spread over the lachrymal sac, will indeed be divided by the incision; but no inconvenience is found to result from this; and a straight cut, such as I have directed, admits of a very free examination of the parts beneath, at the same time that it serves to evacuate more effectually than any other, the tears and mucus which the tumor is found to contain.

An opening being thus formed, the contents of the tumor should be forced out with moderate pressure;

a small doffel of soft lint spread with emollient ointment should be inserted between the lips of the sore, and a slip of moderately adhesive plaster employed to retain it. As a plentiful discharge commonly takes place, it is necessary to renew the dressings daily; and with a view to preserve the opening of a size sufficient for admitting of a free examination of the parts beneath, instead of a doffel of lint, a small piece of prepared sponge may be inserted into the sore every second or third day; but as the swelling of the sponge, by the moisture applied to it, tends to irritate and inflame the contiguous parts, it should previously be covered with a single ply of oiled soft linen, which does not hinder it to swell, at the same time that it allows it to be more easily withdrawn; for the purpose, however, of removing it more readily, a piece of strong waxed thread should be attached to it.

In former times it was the common practice, after opening the tumor, to endeavour to destroy the hard edges of the sore, either with the actual or potential cautery, or with ointments impregnated with red precipitate, and other escharotics. By this the patient was made to suffer much unnecessary pain, and more deformity was produced; while the chance of a cure was much less than when milder dressings are employed. Indeed the only way in which a cure can be effected with this treatment, is the total obliteration of the lachrymal sac and ducts with which it is connected. These being either destroyed, or made to inflame, their internal surfaces might in some instances adhere together, on pressure being applied to them. This, however, could not frequently happen; for while the puncta lachrymalia and ducts connected with them remained open, the tears still finding access to the parts beneath, would necessarily produce frequent returns of the disease; and when, by the violence of the inflammation, these ducts happened to be obliterated, still the patient would be liable to a

constant trickling of the tears over the cheek. This idea, therefore, ought never to be kept in view. Instead of escharotics, the mildest dressings only should be employed; nor should the dossils of lint or sponge that I have advised, be of such magnitude as to produce much pain; all that they are expected to perform, being to dilate the lachrymal sac, by which we may be enabled to search with freedom for the commencement of the duct leading from the sac to the nose.

In this manner any hardness in the edges of the cut will soon be removed; and the fore being sufficiently cleared of a tough viscid kind of mucus, somewhat resembling sloughs, with which, for a few days after the operation, it is always covered, we are now to proceed to the most important part of the cure, the searching for and forming a free passage for the tears from the lachrymal sac to the nose.

This part of the operation is effected in different ways: by clearing the natural duct leading from the lachrymal sac through the groove in the *os unguis* into the nose; or when this is found to be impracticable, we form an artificial opening into the nose directly through the substance of this bone from the under and back part of the lachrymal sac.

As unnecessary violence should always be avoided, we should first endeavour, by the easiest method, to discover the natural conduit of the tears, and to remove the obstruction formed in it. For this purpose, a firm round pointed probe, or the curved instrument, Plate XXV. fig. 2. should be inserted, by the incision, into the bottom of the lachrymal sac; and if the point of it can be passed into the commencement of the nasal duct, some hope may be entertained of the passage being made pervious: some degree of force may indeed be necessary for effecting this; but whenever it can be done, which frequently is the case, by the probe being pushed in a proper direction with moderate pres-

sure, it ought always to be preferred to every other method of treatment.

The passing of the probe into the nose is the most difficult as well as the most uncertain part of this operation; for when this is accomplished, we have it generally in our power to preserve the opening, by keeping a piece of bougie, catgut, or lead wire constantly in it, till the passage of the duct is rendered sufficiently clear. But it sometimes happens, that all our trials for the discovery of the nasal duct prove ineffectual. Much force, however, should never be employed; for, as the point of the instrument will more readily be pushed against the bone than into the duct, it would be more apt to do harm than good. When it enters the superior part of the canal with ease, it may with safety, and with some probability of success, be pushed forward in the manner I have mentioned; but when the duct is obliterated through its whole course, by the sides of it adhering together, an occurrence, however, which I now believe to be less frequent than I once supposed it to be, it would be highly improper, for the reason I have given, to use much force in our endeavours to detect it.

When, therefore, all our trials for discovering the natural passage between the lachrymal sac and the nose prove unsuccessful, as we know that a cure will not be obtained if the tears be not conveyed to the nose, our views must now be solely directed to the formation of an easy and free artificial opening for this purpose.

In the anatomical description that I premised of these parts, we have seen that the posterior part of the lachrymal sac is lodged in and attached to a groove in the os unguis; and as the sac is separated from the cavity of the corresponding nostril by this bone only, it is evident that an opening made from the back part of the sac must serve to convey the contents of it into the nose. It is this part of the operation that we are now to consider.

I have already observed, that the actual cautery was formerly employed for destroying the hard edges of the fore, and as it was a prevailing opinion with almost all the practitioners of the last and preceding centuries, that the fistula lachrymalis was almost always connected with a carious state of the corresponding bones, the cautery was likewise used for assisting in the exfoliation of the diseased parts. In consequence of this, a cure was sometimes accomplished by a remedy that was employed only for the removal of what they considered as an accidental occurrence, and not as a cause of the disease: for the *os unguis* being extremely thin, a hot iron can scarcely be applied to it without destroying it entirely; and as this would in some instances happen, a cure would be sometimes obtained even where the practitioners who employed the remedy were totally ignorant of the manner in which it acted; for as they were unacquainted with the real cause of the disease, from their ignorance of the anatomy of the parts concerned in it, any cures that they performed must have been more the effect of accident than of design.

It is not, however, without surprise, that we find, even in later times, when the cause of the disease is well known, and when the principles of the operation are founded on an exact knowledge of the diseased parts, that the same method of treatment has been continued. Till of late, the actual cautery was very commonly employed by the best surgeons of this country, for perforating the *os unguis*. Even the celebrated Cheselden patronised this method; and it is still practised in several parts of the Continent.

With all the caution, however, that can be employed, of covering the hot iron with a canula, or wet cloths, it is an uncertain and dangerous practice; for parts must be destroyed by it, or at least much injured, which ought not to be hurt, as it is impossible to convey a red hot iron to the *os unguis*, and to destroy

part of this bone, which alone ought to be perforated, without doing mischief to the contiguous parts.

The cautery ought therefore to be laid aside ; and this the more readily, as the same intention can be accomplished with equal certainty, and with more ease and safety, in a different manner, merely by forcing a firm sharp instrument, of the form and size of the common trocar, from the back part of the sac through the os unguis. A curved instrument of this kind has commonly been employed, such as is represented in Plate XIX. fig. 5. ; but the straight trocar, delineated in the same Plate, fig. 2. answers better. With this instrument, the opening through the bone may be made, either by twirling it round between the fingers ; by moving it forward and backwards with the fingers or palm of the hand ; or by pushing it straight forward ; and the surrounding parts may be protected, at the same time that the instrument is more steadily fixed than it otherwise can be, by passing it through a canula, such as is delineated in the same Plate, figure 4.

In proceeding to this part of the operation, the patient's head should be supported by an assistant ; and the surgeon, sitting or standing between him and the window, should introduce the canula of the trocar into the opening made in the tumor ; and the end of it being carried to the under and back part of the sac, it should be kept firm in this situation with one hand, while the stilette is inserted into it with the other : the point of the stilette must now be pushed firmly but slowly forward in a proper direction into the nostril, and we know that it has entered that cavity as soon as a discharge of blood is perceived to take place from it.

In making the perforation, a proper direction to the course of the stilette is a point of the first importance, and therefore merits the greatest attention. If turned in any degree outward, or inclining towards the eye, it would penetrate the orbit ; posteriorly, it would pass

into the ethmoid bone ; and if pushed in a horizontal direction towards the nose, the os spongiosum superius would be injured, while the intention of the operation, that of affording a free passage for the tears into the nose, would be entirely frustrated. In order to avoid these inconveniencies, the instrument should be pushed on towards the nose in an oblique direction downwards and inward from the inferior part of the lachrymal sac. Care should be taken, however, not to endeavour to follow the course of the natural passage of the tears, as by some has been advised ; for in this manner we would not only injure the maxillary bone, but the opening here could not be made so free and large as in that part of the os unguis where the lachrymal sac terminates, and where the commencement of the nasal duct takes place.

On the instrument having reached the nostril, it should be moved with some freedom ; not by carrying it farther in, as this might injure the parts within the nose ; but by giving it a free rotatory motion, so as to render the opening made with it sufficiently pervious : this being done, the stilette should be withdrawn, when a lead probe, fully equal to the size of the canula, should be introduced, and then the canula should be taken out. One end of the lead should pass freely through the opening in the os unguis, and the other must project about the eighth part of an inch or thereby past the level of the external fore. With a view to prevent the lead from slipping altogether into the nose, this projecting part of it should be somewhat curved after the canula is withdrawn. The fore should now be covered with a small pledget of lint spread with emollient ointment, and the whole may be retained with a slip of adhesive plaster ; for no bandage can be kept on these parts but with much inconvenience and distress.

In this manner the operation is completed ; but much attention is necessary on the part of the surgeon to preserve the opening, and to prevent it from filling

up in future. With this view, the lead probe must be continued for a considerable time, in order to render the passage as callous as possible ; care being taken to withdraw it every day or two, for the purpose of clearing it and the sore from any impurities ; and at each dressing a quantity of infusion of oak bark, a solution of alum, or any other astringent, should be injected with a small syringe from the external opening into the nose. The syringe, fig. 1. Plate XX. answers this purpose properly.

No certain period can be fixed, at which we can say the passage will be sufficiently callous, and at which the lead probe may be withdrawn ; for this will in some measure depend on the constitution of the patient, as well as on the particular state of the parts themselves. In some instances, it may possibly be done with safety in a shorter period ; but I have never ventured on taking it away till the eighth or ninth week has elapsed, commonly not so soon. The inconvenience attending it is inconsiderable ; and we are to remember, that the successful issue of the operation is to depend greatly on due attention to this part of it ; for if obstruction should afterwards occur, either from the opening in the bone filling up with callus, or from the softer parts adhering together, the patient will soon be in the same diseased state as before any attempt was made towards a cure.

On withdrawing the lead, the external opening should be cleared from any mucus with which it may be stuffed ; and as by this time it will be reduced to a very small size, it will soon heal merely by laying the sides of it together, and covering it with a piece of adhesive plaster : or, when this does not succeed in a few days, touching the edges of the sore with caustic will in general complete the cure quickly. In the mean time, moderate pressure should be applied on the course of the lachrymal sac, either with the finger of the patient frequently placed on it, or by means of the machine, Plate XIX. fig. 1. And this

should be continued, till there is reason to suppose that the sac and contiguous parts have again recovered the tone of which they were deprived by the long continuance of the disease, as well as by the operation.

What I have said with respect to the propriety of continuing the lead probe for a considerable time, and of applying pressure afterwards on the course of the sac, is equally applicable when the natural passage of the tears has been discovered, as when an artificial opening is formed in the manner I have advised. Indeed more attention is necessary to this point in the one case than in the other; for we find by experience, that the disease is more apt to return when the operation is finished by the tears being carried through the nasal duct, than when an artificial opening is made for them; owing, as I imagine, to a wider and more free passage being commonly formed by this last method of conducting the operation.

Instead of a probe of lead, some practitioners employ a piece of catgut or common bougie; but neither of these answers the purpose so well. They are more difficult to introduce; they retain the mucus of the part, and therefore are not so cleanly; they are apt to be entangled by the newly divided bone; and they do not answer so well for rendering the passage callous as the other.

I have thus described the different steps of the operation; and the practice I have advised is such as experience has proved to be the most successful. It must indeed be acknowledged, that it does not in every instance succeed; for cases frequently occur which render fruitless every attempt that can be made for curing them. After performing the operation in the most satisfactory manner; when the passage for the tears has been rendered completely pervious; and even where external pressure has afterwards been continued in the most attentive manner; the disease is sometimes found to recur. In such instances, however, we conclude, that scrofula, or some other disease

of the constitution, takes place ; by which alone, or by the contiguous bones being carious, this operation, when properly performed, can be rendered abortive. It may sometimes indeed fail by too small an opening being formed in the os unguis ; but this is the fault of the operator, and not of the operation. There is no cause for timidity on this point : for although it has been alleged that mischief may ensue from breaking this bone with the trocar, yet daily experience tends to prove the contrary ; for even where it has been broken with much freedom, I never knew any inconvenience arise from it.

In order to prevent the bad consequences which those not accustomed to this operation have supposed would occur from the splintering of this bone with a trocar, it has been proposed to take out a piece of it entirely with a sharp cutting instrument, such as is delineated in Plate XVIII. fig. 3.

By applying this instrument to the os unguis, in the manner that I have mentioned for the use of the trocar, a portion of the bone may be easily cut out ; but there is no necessity for this precaution. The operation is more effectually done with the trocar ; and as no danger is found to ensue from it, it ought to be preferred.

In the treatment of this disease, when it is unfortunately found to return even after the operation has been properly performed, if it appears to arise from a carious state of any part of the contiguous bones, a cure may yet be accomplished by laying the tumor again open ; by endeavouring to accomplish an exfoliation of the diseased bone ; and by afterwards forming another opening in the os unguis in the manner I have directed, if the opening made by the separation of the exfoliated pieces of bone be not sufficient. But when a relapse takes place, without some obvious cause of this kind, as any opening we might form in the bone would probably be obliterated by a continuance of the same disease of the system by which the first at-

tempt was rendered fruitless, it could answer no purpose to repeat it, were it not with a view to make trial of a different mode of operating.

A considerable time ago it was proposed by different practitioners, to obviate the uncertainty attending this operation, by introducing a small canula of gold or silver, either through the natural passage of the os unguis, or through an opening made with a trocar; and by leaving the canula, and healing the skin over it, thus to form a passage on which no disease of the constitution could have any effect. By those who consider the usual operation for the fistula lachrymalis as very uncertain, it has been proposed to employ a canula of this kind in every case; but as this operation, when properly performed, proves frequently very successful, and as patients usually consider it as a severe measure to have an extraneous body left in a wound with a view to remain, it may be proper not to advise it in any case, till on trial we have found that the other will not succeed. In every case, however, where the usual operation has failed, the method of cure by a canula ought to be tried; and when properly performed, it will very commonly succeed. Tubes for this purpose should all be of gold, as being less apt to be injured by the fluids of the part in which they are left than any other metal; and much care should be taken to have the canula well polished, and as exactly fitted as possible to the parts in which it is placed. When properly fitted, it gives little pain, even from the time of being introduced, and at last it frequently fits with perfect ease. In Plates XX. XXV. and XXVII. different forms are delineated of these tubes, but of these fig. 5. and 6. Plate XXV. as recommended by Mr. Pellier, are the best. They are of a length that experience has shewn to answer in the most part of adults; and their diameter should be as large as the opening in the bone can admit, with a view to prevent, with as much certainty as possible,

the tears and mucus that may pass into them from stopping them up.

The proper length of the tube is obviously a point of the first importance in this operation. For, if too short, it will fail, by the under part of it being apt to be plugged up with the lining membrane of the nose, and if too long, by the end of the tube being pressed against the septum nasi on the opposite side of the nostril. This last objection appears to apply to the tubes of Mr. Wathen, which, in one case in which they were tried here by my friend Dr. Wardrop and me, proved unsuccessful, chiefly from this cause; and as Mr. Pellier's tubes, which are considerably shorter than Mr. Wathen's, have answered in every case in which I have known them used, I conclude that in this respect, as I believe in every other, they are preferable to those of Mr. Wathen. As the directions given for the use of Mr. Pellier's tubes in the next section, are sufficiently full, I shall now refer to them; and directions for those of Mr. Wathen will be seen in the explanation of Plate XXVII. in which the tubes that he recommends are delineated.

In describing the progress of the disease, I had occasion to observe that the tumor in the corner of the eye, when it inflames and suppurates, proceeds at last to a state of ulceration. This circumstance, however, does not point out any difference in the method of cure; only in this case, instead of using a lancet for laying the sac more freely open, a cut should be made with a scalpel upon a director introduced at the ulcer. In every other point, the cure is to be managed as I have already advised, by rendering the natural passage of the tears pervious when this is found to be practicable; and, when this cannot be done, by making an artificial opening through the os unguis.

When, again, the os unguis and other contiguous bones are found to be carious, the fores should be preserved open till the diseased parts are all removed; when, if a large enough opening is not formed for the

passage of the tears, by the pieces of bone which have been taken away, it may now be made, and all the other steps of the operation completed in the manner I have already pointed out. In local affections of these bones, a cure may thus be in some instances accomplished; but where the caries depends upon a venereal taint, as is not unfrequently the case, although a well conducted course of mercury may cure the general disease of the constitution, it is seldom able to prevent very extensive exfoliations of the diseased bones; by which, the natural passage of the tears being destroyed, and the bones through which they should be conveyed being perhaps altogether removed, they must in future pass entirely over the cheek; for in such circumstances art can afford no relief.

SECTION XIX.

Additional Remarks on Diseases of the Eyes.

IN the preceding sections of this chapter, the diseases of the eyes were so fully treated of, that it was not my intention to say any thing further upon them: but a foreign oculist, M. Jean François Pellier, having appeared in this country, where he deservedly acquired much reputation, I judged it proper in the former editions of this work, to communicate such parts of Mr. Pellier's practice as appeared to be of importance. Possessing the advantages of a liberal education, a sound judgment, and much experience, Mr. Pellier has been enabled to suggest improvements in the treatment of almost every disease to which the eyes are liable; and an uncommon degree of steadiness, conjoined to a quick eyesight, give him a command of himself, and a facility of operating, not often attained. I think it proper likewise to remark, that Mr. Pellier communicated to me his knowledge of the dis-

eases of the eyes in the most candid manner; which puts it in my power to lay his observations before the public, he having given me permission to do so.

While, by giving an early account of material improvements, I thus acquit myself of an obligation to the public, I at the same time embrace, with much satisfaction, the opportunity which it affords of announcing the merit of an operator, who, although a stranger, and as yet not much known in this country, is perhaps one of the best oculists now in Europe.

In the first place, I shall mention what I have learned of Mr. Pellier's practice; and shall then offer such remarks as occur to me upon it.

On the subject of the cataract his observations are particularly valuable. By attentive examination, he can in many instances say whether a cataract is hard, somewhat soft, or altogether fluid; and as his method of operating varies according to these circumstances, it is of importance to be able to determine *à priori* with regard to them. He can also ascertain, whether a cataract is of a large or small size; by which he is often directed in the different steps of the operation.

I know that these are circumstances which practitioners in general consider it as impossible to judge of with precision, particularly with respect to the consistence of cataracts; and I must acknowledge, that I was clearly of this opinion, till of late that I was convinced of the contrary, not by Mr. Pellier's assertions alone, but by different proofs of the fact. I assisted Mr. Pellier in different cases where the cataract was extracted: in all of them he previously foretold the consistence and size of the cataract with perfect confidence; and in every instance his prognosis was precise and accurate. I am credibly informed, too, that this happened with other practitioners in whose presence he operated in different parts of this country.

He distinguishes several varieties of cataract, which in practice ought to be kept in view.

The three principal varieties that he mentions are, what he terms the true or curable cataract; the mixed or doubtful kind; and the false or incurable.

1. What he terms the curable or true cataract, is known by the pupil retaining its natural power of contracting and dilating in full perfection, while the patient is at the same time able to distinguish the light of a candle, or of any other luminous body, and even certain bright colours, such as red, green, &c.

2. The mixed or doubtful cataract, is attended with a weak feeble contraction and dilatation of the pupil, and the patient can scarcely distinguish light from darkness. Along with an opaque state of the lens, this is supposed to be attended with a disease of the retina, or of some other part of the eye.

3. In what he terms the false or incurable cataract, along with an opaque state of the lens, there is evidently a diseased state of the pupil, which remains immovable to whatever degree of light it may be exposed, at the same time that the patient does not distinguish between the most brilliant light and perfect darkness.

Cataracts may be either simple or compound, or they may be complicated with other affections.

1. A simple cataract is a mere opacity of the crystalline lens, all the other parts of the eye remaining perfectly sound.

2. A cataract is said to be of a compound nature, when blindness is produced by an opaque state of the body of the lens, of the liquor which surrounds it, and of the capsule.

3. The disease he considers as complex, when it is conjoined with other affections of the internal parts of the eye; the most frequent of which is amaurosis.

Cataracts are not unfrequently attended with a dissolution of the vitreous humour, and sometimes with an opaque state of it. This variety of the disease is for the most part produced by violent inflammation. It is easily distinguished by those accustomed to an at-

tentive examination of the eye ; and it is particularly necessary for operators to be well acquainted with it ; for no operation, either extraction or depression, should be ever advised for it. The operation has never in any instance of this kind of cataract been known to succeed ; and for the most part, Mr. Pellier observes, it is productive of very dreadful pain, and the most violent degree of inflammation that he ever met with. In general, too, the pain and inflammation induced in this manner remain fixed and permanent, without yielding in any degree to the usual remedies.

Cataracts are sometimes accompanied with an imperforated iris ; in which case, as no light can pass to the bottom of the eye, no degree of vision takes place ; and at other times they are complicated with adhesions, either to the iris, or to the capsule of the vitreous humour. Preternatural adhesions of the lens to the capsule of the vitreous humour can scarcely be distinguished by the eye ; but they take place very commonly where cataracts have been originally produced by, or attended with, much inflammation ; and they always render the operations of extraction and couching difficult. It is this kind of adhesion, Mr. Pellier imagines, which prevents the operation of couching from succeeding so frequently as it otherwise might do ; for when it takes place in any degree, the cataract, he supposes, will always rise again on the needle being removed from it.

In forming an opinion of cataracts from the real seat of the disease, different circumstances require attention.

1. It often happens, as I have already remarked, that the lens only is opaque. This variety of the disease is most frequent, Mr. Pellier observes, in adults, and especially in old age.

2. When the opacity is seated in the capsule of the lens, if the anterior part of it only is diseased, it ap-

pears to be remarkably white, and to be placed very contiguous to the iris ; while, on the contrary, if the posterior part of it only is opaque, it is commonly of a grey colour, and the opacity appears to be deep seated.

It sometimes happens, both after the operation of extraction and couching, that in the course of ten or twelve days, the capsule of the lens, which at first was perfectly found, becomes quite opaque. This variety of the disease Mr. Pellier terms the *cataracte secondaire*.

3. When the body of the lens and its capsule are both opaque, the cataract is commonly soft or even altogether fluid. In this case, much care is required in the operation to prevent the capsule from bursting : a degree of nicety, Mr. Pellier observes, at which those not much accustomed to this branch of practice can seldom arrive, but which is very practicable with operators of experience.

4. In some instances, cataracts appear to proceed from a partial affection of the lens, small opaque spots being observed in it, while the rest of it remains found. In this case, vision is always most perfect in an obscure light, when the pupil is most dilated.

In forming an opinion of the consistence of cataracts, three circumstances particularly require attention.

1. When a cataract is of a firm consistence, it is in almost every instance somewhat brown ; it appears in general directly behind the iris ; not so deep as the lens is usually placed ; and the pupil dilates and contracts very slowly.

2. A fluid or soft cataract is not commonly white, but rather of a cream colour, somewhat resembling purulent matter ; and for the most part in this variety of the disease, the globe of the eye appears full, and somewhat more prominent than it usually is.

3. It sometimes happens, Mr. Pellier observes, that along with this fluid state of a cataract, the capsule is

much thickened. To this he gives the appellation of the cystic cataract.

The colour of a cataract is another point of importance.

1. I have just observed, that a soft or fluid cataract is for the most part of a cream colour ; but in that variety of the disease sometimes met with in children at birth, although it is always fluid, the colour is almost always a milk white. In general, however, at other periods of life, a white cataract is of a cheesy consistence.

2. When a cataract is yellow, a small portion of the lens often remains hard, the rest of it being dissolved into a thin transparent fluid, forming that variety of the disease usually termed the hydatid cataract.

3. Although a black cataract is not a frequent occurrence, Mr. Pellier says he has met with it in different instances. The only disease for which it may be mistaken is the gutta serena ; but with due attention, the one may be distinguished from the other. In the gutta serena the disease for the most part comes on suddenly, the pupil is of a deep black, it remains immoveable in every degree of light, and the patient cannot distinguish colours, or the clearest light from perfect darkness ; whereas in the black cataract, the accession of blindness is commonly slow and gradual ; the pupil, to a certain degree, contracts and dilates on being exposed to light. The bottom of the eye is of a dark colour, but not of such a deep black as in the gutta serena ; and the patient can distinguish light and vivid colours. In short, the symptoms of this variety of the disease are exactly the same with those of the common cataract ; only, instead of being white, the opacity is black.

Mr. Pellier prefers the method of cure by extraction, excepting in a few cases where the pupil is uncommonly small, when he operates by depression. He always prepares his patients for the operation, by con-

fining them to a low diet for five or six days ; by giving two or three doses of salts and fenna ; and when plethora prevails, he takes away ten or twelve ounces of blood.

In extracting the cataract, he makes the incision of the cornea in the ordinary place, and of the usual size ; but he has some peculiarities in his method of doing it.

Instead of placing the patient with his face opposite to a clear light, he seats him with his side towards it. If he is to operate upon the left eye, he uses his right hand, and the right side of the patient is placed towards the window. He always uses his left hand in operating upon the right eye ; and in this case the patient is made to sit with his left side towards the light.

The patient being seated, with the other eye tied down with a bandage, an assistant supports his head behind, while, at the same time, he fixes the eye on which the operation is to be performed, with the speculum, fig. 5. Plate XXII. The figure represents the instrument of the full size. It is made of wire ; and may either be of gold, silver, or any other metal. The head being fixed by pressing it against the breast with one hand under the chin, the assistant takes the speculum in the other ; and placing the round curvature of one of the ends of it upon the upper eyelid immediately behind the cartilaginous border, he must by gentle gradual pressure upon the eyeball, fix it above, while the operator with the fore and middle fingers of his left hand, when the operation is to be done upon the left eye, must fix it below, at the same time that he draws down the under eyelid. In using this speculum, the upper eyelid is forced almost entirely into the orbit behind the eyeball, but it immediately returns to its natural situation on the instrument being removed.

The eye being thus fixed, the knife, figure 1. Plate XXII. fixed in its handle, must be put into the operator's right hand, who now divides the cornea in the

usual manner : but when the point of it comes opposite to the pupil, if the capsule of the lens is to be divided, Mr. Pellier has arrived at such dexterity in this operation, that he plunges the point of the knife through the pupil into the lens ; and withdrawing it gently, he carries the point of it forward to the opposite side of the eye, and finishes the operation in the usual way. But in making the latter part of the incision, he is very attentive to the pressure made by the speculum, which he desires the assistant to remove entirely before completing the incision, in order to prevent the vitreous humour from escaping.

This being done, the eyelids are immediately shut ; and while they are in this state, a slow, gradual pressure is made upon the eyeball, with the flat end of the instrument, which he terms a curette, fig. 1. Plate XXV. which for this purpose is placed immediately above the tarsus of the upper eyelid. As the access of light to the eye is thus prevented, the pupil remains in a state of dilatation, by which the lens is more easily pressed out than it otherwise could be ; and if the pressure is cautiously applied, no part of the vitreous humour is ever forced out.

When the cataract does not come out entire, which is sometimes the case, or when it is found to adhere to the contiguous parts, the end of the curette is introduced through the pupil, and any adhesions that take place are gradually separated ; at the same time that any detached pieces of the lens are turned out through the cut in the cornea : or, instead of the curette, the cistatome, fig. 3. Plate XXIV. is sometimes employed for separating the adhesions.

In the course of this operation, it sometimes happens that the iris is forced too much forward into the anterior chamber of the eye, or even altogether through the cut in the cornea. With a view to prevent the bad effects that might result from this, Mr. Pellier insinuates the flat side of the curette into the

wound in the cornea, and by means of it endeavours to put the iris into its natural situation.

This is the usual method in which Mr. Pellier performs this operation; but circumstances sometimes occur that require some peculiarity of management. The most material of which are these: when he has reason to think that the cataract is in a fluid state without any opacity of the capsule, instead of making an opening in the cornea of the usual size, he inserts a sharp pointed knife, somewhat convex on the back, into the inferior part of the transparent cornea, at a small distance from the iris; and having made an incision of about the tenth part of an inch in length, he pushes the point of the instrument upwards till it comes opposite to the pupil, when he carries it cautiously on till it reaches the lens; and having now made an opening in the capsule sufficiently large for discharging the fluid contained in it, he withdraws the instrument with the same caution with which it was introduced, and in this manner the operation is finished: the cataract being in a state of fluidity, the whole of it passes easily off without any pressure.

When, again, along with a soft or fluid cataract, there is reason to suppose that any part of the capsule is opaque, or even where the capsule alone is supposed to be diseased, he carefully avoids opening it or bursting it in the course of the operation: in either of these events, he says it would be with difficulty extracted. He therefore by slow gradual pressure with the curette, in the manner I have mentioned, forces out the lens, contained, as he imagines, in its capsule or cyst; and he does it, he says, in every instance without forcing out any part of the vitreous humour. In some cases, however, he finds it necessary to introduce the end of the curette through the pupil, and to separate the capsule of the lens from the contiguous parts; but even this, he says, does no harm to any part of the eye. The importance of our being able to judge from the appearances of a cataract, of the

real state of the disease, is therefore sufficiently obvious, from the difference which this variety of it requires in the method of conducting the operation.

In extracting the cataract, it is a matter of the first importance to avoid the iris with the knife; but as this is extremely difficult in eyes that are not prominent, Mr. Pellier often employs a knife with that side of it convex which passes next to the iris. One of these instruments is represented in Plate XXII. fig. 2. In every other respect this knife is the same with that which he uses in ordinary cases, represented in fig. 1. of the same plate.

In the course of this operation, it sometimes happens that the aqueous humor escapes in too great quantity before the point of the knife is carried across the eye so as to penetrate the opposite side of the cornea: when this takes place, which it often does when the hand of the operator is not perfectly steady, as the iris is apt to pass in before the point of the instrument, Mr. Pellier advises the sharp pointed knife to be withdrawn, and another with a probe point, fig. 3, to be introduced at the opening; and the point being slowly carried over to the opposite side of the eye, an incision is there to be made, either with the other sharp pointed knife or with a common lancet, sufficiently large for letting out the blunt point of the other; when the operation is to be finished, by pushing it forward, and making a semicircular incision in the usual way in the under part of the cornea.

As soon as the cataract is extracted, it is the common practice to present a watch or some other object to the patient, with a view to discover the success of the operation. In some instances Mr. Pellier has been forced to consent to this; but he does not approve of it. Instead of this, he immediately closes the eyelids, and covers each eye with a small bag of soft old linen or cotton about half filled with soft fine wool. These bags are applied dry, and are fixed with pins to a circular bandage of old linen passed round the forehead,

which again is kept firm in its situation by a slip of the same linen made to pass beneath the clin and over the upper part of the head ; care being taken to fix them both with pins to the night cap below.

The patient is now to be undressed, and with as little exertion as possible should be laid in a bed, upon his back, with his head low : in this situation he is desired to remain with as little variation as possible during the first six or eight days, as it tends more than any other in which he can be placed to a speedy cure of the wound in the cornea. If the patient is not low and emaciated, Mr. Pellier always advises eight or ten ounces of blood to be taken in the course of a few hours after the operation. He keeps him on a low diet, and gives small doses of opiates from time to time, which answer better than a large dose at once, which often excites sickness and vomiting, symptoms that ought to be guarded against ; for nothing so readily hurts the eye after this operation as the exertion of vomiting, coughing, and sneezing. For which reason he does not admit of snuff or tobacco in any form being used for the first eight or ten days.

An easy stool is procured daily, and on the fourth or fifth day the dressings are removed ; when after clearing the eye of any mucus or matter that has formed on it, and the eyelid being cautiously lifted, the same kind of bandage is applied again. From this time forward, the dressing is renewed every second day, and in ten or twelve days from the operation, the eye should be bathed before the new bandage is applied, with a weak saturnine solution ; but till this period, warm milk and water is considered as preferable. About the end of the third week, the bags of wool, after having been gradually lessened, are taken away, and a piece of green silk put over the eyes instead of them. If no unusual interruption occurs to the cure, the diet is now made gradually better ; and when the operation has been performed on one eye only, Mr. Pellier commonly allows the patient to go abroad at

the end of the fourth week, but never sooner ; and even then the eyes are kept well covered : but when both eyes have been cut, he advises a confinement of at least six weeks.

This is the plan of treatment which Mr. Pellier pursues in ordinary cases ; and he attributes much of the success of his operations to a rigid observation of these regulations. But where there is a particular tendency in the system to inflammation, remedies of a different kind are necessary.

The eye becomes in some cases so much inflamed even in the course of a few hours from the operation, that one bloodletting is not sufficient. In this case he advises leeches to be applied to the temple and contiguous parts ; and if a second or third general evacuation is necessary, he directs the blood to be taken from the foot, as by experience he finds this to answer better than taking it from the arm or neck. The patient is desired to drink plentifully of Arabic emulsion, with a large proportion of nitre. The pediluvium frequently repeated, he finds proves useful. And, for the removal of that violent pain which inflammation supervening to this operation commonly excites, nothing that has yet been tried, he thinks, answers so well as a liniment composed of the white of an egg and powdered alum beat for a considerable time together : a little of which should be applied to the eye every two hours between two plies of soft old linen. Besides affording relief from pain, it tends more effectually than any other remedy to stop the progress of inflammation ; inasmuch, that Mr. Pellier employs it in every case as soon as the eye begins to inflame.

Instead of alum, he sometimes adds to the white of an egg three grains of white vitriol, and the same quantity of saccharum saturni dissolved in a spoonful of rose water ; and the whole being well beat together till it puts on the appearance of white froth, a little of this is inserted between the eyelids with a small pencil three or four times a day, at the same time that the

eyelids are covered with a small bag of thin linen in which some of it is contained. When the heat and pain attending the inflammation begin to abate, he advises a poultice composed of a ripe apple, well boiled, with the water pressed out of it, to which he adds a small quantity of camphor and powdered saffron.

By persevering duly in these means the inflammation is commonly at last removed. In some instances, however, this does not happen, and notwithstanding the utmost attention, all the symptoms become worse; the vessels of the tunica conjunctiva become turgid; the eyelids swell to a considerable size; and the pain, which before was severe, becomes insupportable. In this situation, nothing tends to stop the inflammation but local bloodletting carried to a considerable extent by incisions made in the affected parts. For this purpose the mere division of the turgid vessels with a lancet or small scalpel sometimes answers; but in general it succeeds better by taking away small portions from different parts of the internal surface of the eyelids with small convex scissars, such as is represented in Plate XXII. fig. 4. This, Mr. Pellier observes, seldom fails of giving immediate relief; he has never found that it does harm afterwards, and the state of the eye being very critical, no remedy should be omitted that affords any chance of obviating the danger; for if this is not quickly done, suppuration will soon take place, either in the coats of the eye, or in one or both of the chambers, by which the power of vision is very commonly destroyed.

When matter is evidently formed, a frequent use of warm emollient steam, applied to the eye by means of a funnel of pasteboard, or of any other substance, will sometimes produce a slow discharge of it at the cut in the cornea: but when this does not succeed in the space of a day or two, no more time should be lost; the matter should be discharged by an incision, made in the most depending part of the abscess, when seated in the substance of the cornea; or, by opening the

lips of the incision made for extracting the cataract, when the collection is in either of the chambers of the eye. By this means the patient will be immediately relieved from pain, while, at the same time, it will give him the only chance of preserving the use of his eye.

During the first two or three weeks after this operation, a kind of herniary swelling is apt to form in the eye, by the iris or some other part being forced out at the opening in the cornea, either by violent coughing, sneezing, or some other effort; and in some instances, by exposing the eye too soon and too frequently before the cicatrix is sufficiently firm for resisting the pressure thus produced on it. When the tumor is small, it may commonly be removed by touching it frequently with a small pencil dipped in Goulard's extract of lead, concentrated by evaporation, or in any mild antimonial escharotic; an attempt, Mr. Pellier observes, that may be made with safety, if care be taken to prevent the caustic from hurting the rest of the eye, by touching the diseased part only, and immersing the eye immediately in warm milk, or in some warm emollient decoction. But when the disease is farther advanced, and the tumor firm and solid, it answers better to remove it entirely either with the scalpel or scissors; or if it appears to be any part of the aqueous humour contained in a thin membranous production, as is sometimes the case, all that is necessary is, to make an opening into it with a lancet of a size sufficient to discharge what it contains. It is scarcely necessary to observe, that after either of these operations, the parts must be treated with much attention, otherwise much harm would arise from it. A strict antiphlogistic regimen must be observed. The eye should be lightly covered, either with a small bag, such as I have mentioned above, filled with soft wool, or with a compress of old linen soaked in a weak solution of saccharum saturni.

Mr. Pellier's method of extracting the cataract, which I have thus endeavoured to describe, with his

treatment of the consequences that sometimes ensue from it, is the result of much experience, and usually answers better than any other with which we are acquainted. Much of Mr. Pellier's success undoubtedly proceeds from his superior dexterity in performing the operation; but much of it also depends upon the minute attention that he gives to every case for a considerable time after the operation. In ordinary practice, and especially with the most part of itinerants, it is commonly supposed, if the operation is properly performed, and if the cataract comes away easily, that little more is required of the operator; but it is much otherwise with Mr. Pellier, who considers the after treatment as so essential, that he commonly declines to operate where he cannot have the subsequent management of the case for two or three weeks: and by constant and assiduous attention, he is often able to obviate symptoms that would otherwise prove alarming; and which often might render operations altogether abortive, which might otherwise be attended with complete success. This I had various opportunities of observing.

In the preceding section, I entered into a full discussion of the respective merits of the two operations of couching and extracting the cataract; and I then endeavoured to establish the preference of the former: but if experience shall shew, that Mr. Pellier's method of operating is attended with more permanent advantages, I shall be very ready to retract my opinion; for which purpose, I shall carefully attend to the consequences of those operations that he has performed in this country; and as the public will probably be interested in them, I shall at some future period perhaps communicate the event of them.

There are two points of importance in this operation, with respect to which I differ in opinion from Mr. Pellier. When he considers it as proper to divide the capsule of the lens, he frequently does it, as I have already observed, by insinuating through the

pupil the point of the same knife with which he makes the cut in the cornea, even before the incision is completed.

This may possibly be done with safety by such a very dexterous operator as Mr. Pellier : but as most practitioners, by imitating him, would run the risk of hurting the iris, the practice should not be encouraged ; for when the capsule of the lens is to be divided, it is surely better to do it after the incision of the cornea is finished, by lifting up the flap, and passing in the end of the blunt probe represented in Plate XVIII. fig. 5. or of the cistatome, Plate XXIV. fig. 3.

The other point to which I allude, respects the practicability of extracting the capsule of the lens, without doing any material injury to the eye.

When the cataract appears to be of a firm consistence, and when the disease is supposed to be confined entirely to the lens itself, Mr. Pellier frequently opens the capsule in the manner I have just described, with a view to allow of a more easy extraction of the lens ; and in this case he admits that the capsule remains in the eye : but when he finds, after an operation, that the capsule of the lens becomes opaque, or if he observes that any part of it has been previously in a state of opacity, he advises it to be cautiously extracted with small forceps : and again, in every case where he suspects the cataract to be fluid, forming what he calls the cystic or hydatid cataract, he avoids the division of the capsule, and advises the lens to be taken out included in it ; which he says may be done in the manner I have mentioned, by making an equal and gradual pressure upon the ball of the eye immediately after the division of the cornea ; or by separating any adhesions that take place between the capsule of the lens and the contiguous parts, with the curette, Plate XXV. fig. 1. passed through the pupil.

I have not indeed seen Mr. Pellier extract the capsule of the lens, after removing the lens itself ; for no cases requiring it occurred during his residence here :

I received, however, full information of his method of doing it, by introducing small forceps at the pupil. But as I cannot imagine how this can be done without injuring the eye materially, I must still retain the opinion I advanced of it in a preceding section, till I have evident proofs of its being practised with advantage. And whenever these are offered, I shall receive them with much satisfaction, as it would in many instances be a material improvement of this operation.

We have now to consider the possibility of extracting the capsule entire along with the lens: several practitioners in this country had opportunities of seeing Mr. Pellier extract cataracts, as they supposed, in this situation. I saw him operate in two instances of this kind, where he, as well as several others, imagined that the real capsule was taken out along with the lens; but as I entertain a different opinion on this point, it is proper to state the reasons which have led to it.

1. The capsule of the vitreous humour, and that which contains the lens, are so intimately connected together, that it is difficult, or perhaps impossible, for the best anatomist to determine whether they are separate productions or not: at least they are so intimately connected, that they appear to be formed of the same substance, the crystalline lens being surrounded with a coat which seems to be a thin lamella of that which forms the capsule of the vitreous humour. The contrary, I know, has been alleged; but whoever will make the experiment, will find that the capsule of the lens has exactly the appearance that I have mentioned. It appears to be a production of the other; and they cannot be separated without tearing or destroying some part of one or both of them: now, if this is the case when the contents of the eye are all laid open, and when all the assistance can be got that nice dissection affords, it appears to me impossible that they should be separated in the operation of extracting the

cataract, without injuring the rest of the eye, and particularly the vitreous humour, very materially.

2. In performing this part of the operation, viz. in attempting to extract the capsule of the lens entire, Mr. Pellier does it by means which do not appear adequate to the intended effect. He does it in most instances, by making a gradual equal pressure over the ball of the eye, and not by the introduction of forceps. Now, it is difficult to conceive in what manner pressure applied to the eye can separate that intimate connection which certainly takes place between the capsule of the vitreous humour and that of the crystalline lens : by pressure they are frequently both forced out ; but no operator would wish to meet with this, and no person guards with more anxiety against it than Mr. Pellier, inasmuch, that the escape of the vitreous humour, or even of any part of it, is an occurrence he rarely meets with. In some cases, indeed, Mr. Pellier insinuates his curette, as I have already remarked, through the pupil, with a view to detach the capsule of the lens from the contiguous parts : he allows, however, that this is not always necessary ; and besides, there is much cause to suspect, that the eye would often be hurt by it.

3. When it is found, however, as I have already observed, either during the operation or afterwards, that the capsule of the lens is opaque, even Mr. Pellier himself does not attempt to extract it by pressure. In this case he does it with forceps passed through the pupil. Now, if pressure answers in one variety of the disease, it ought probably to do so in others, so that the use of forceps should not be necessary ; but it is only in the hydatid or soft cataract which Mr. Pellier allows that this practice by pressure succeeds.

4. But as several practitioners, both here and elsewhere, have seen Mr. Pellier extract the cataract, surrounded, as they imagined, with its proper capsule ; and as he asserts with confidence, that it may be done merely by pressure ; it will be asked, in what manner

is this apparent contradiction to be explained? I can account for it only on the supposition of there being in all such cases, where this practice of extracting the capsule entire is considered as admissible, a preternatural formation of a new membrane within the capsule of the lens; which being of a firmer nature than the capsule itself, and probably very little, if at all, attached to the contiguous parts, we can easily see how it may be forced out entire, even by moderate pressure, and how easily bystanders may be deceived with it. When I first saw it done by Mr. Pellier, as he previously said that he would extract the whole capsule along with the lens; as I had heard from very respectable authority that he had done it in different instances in Glasgow; and as I certainly saw the crystalline pushed out, surrounded with a membranous bag, I must own that I was nearly converted to Mr. Pellier's opinion: but on further consideration, the reasons I have mentioned against it appeared too conclusive, even for this weight of evidence, to remove; and since that period, a circumstance has occurred, which with me puts the matter beyond a doubt. A cataract of a soft nature was extracted by Mr. Pellier, surrounded with this membrane or bag quite entire. From the first I doubted much of its being the proper capsule of the lens, as it was said to be; for this tunic is well known to be exceedingly fine and delicate; whereas this membrane was firm, and required some degree of force to tear it. The patient, however, distinguished objects immediately after the operation; and what was then advanced concerning it could not be well refuted: but by some cause or other, possibly from the eye becoming inflamed, an opacity soon began to form in the old site of the crystalline, directly behind the pupil, forming to all appearance a real cataract; and it now continues, even after the inflammation is removed. Whatever explanation may be given of this by those who are inclined to support the contrary opinion, it proves to me a convincing proof

that some deception takes place where the capsule is supposed to be extracted entire along with the lens ; for in this case, where the capsule was imagined to be taken entirely out, the opacity which succeeded, and which still exists, appears evidently to be seated in the capsule, and no where else. I therefore conclude, where practitioners have imagined the capsule was extracted entire, that they have been deceived by the lens being enveloped with a preternatural bag or cyst, formed perhaps by an inflammatory exudation from the internal surface of the capsule : that this production, however, is certainly formed in this manner, I will not positively assert ; but in my opinion it is the most probable way by which we can account for it.

These are the remarks that I have to offer on Mr. Pellier's theory and practice in the treatment of cataract. If further observation shall convince me that I am wrong, I will readily acknowledge my mistake ; but, in the mean time, the reasons I have adduced, appear to evince the impropriety of extracting the capsule piecemeal, by means of forceps passed through the pupil, as well as the impossibility of making it pass entire along with the lens.

It sometimes happens in smallpox, as well as in severe inflammation of the eye from whatever cause it may proceed, that the centre of the cornea is left in a state of opacity, by matter forming between the coats of it. When not carried off by the remedies usually employed, if the iris, retina, and other parts of the eye appear to be sound, Mr. Pellier advises an operation, from which he has in different instances derived much advantage. The centre of the cornea being opaque, the rays of light are thus prevented from passing to the bottom of the eye through the pupil ; but when the sides or external border of the transparent cornea still remain clear and sound, light may be allowed to pass to the retina, by enlarging the pupil ; which, Mr. Pellier says, may be done with safety by

making an incision from one side of the iris to the other. And his method of doing it is this: he first makes an opening in the prominent part of the cornea, in the same manner as for extracting the cataract: he then inserts a small grooved director beneath the flap of the cornea through the pupil; and having passed it in a horizontal direction, immediately behind the iris, towards the outer angle of the eye, he now takes a pair of small curved scissars, and passing one of their blades along the groove of the director, he at once divides this part of the iris, when he withdraws the instruments, and makes a similar cut on the opposite side of the eye. In this manner, when the opacity is confined to the centre of the cornea, which it often is, the rays of light which pass through the sides of it get access to the bottom of the eye, by the pupil being extended from one side of the iris to the other; and thus a degree of vision is produced which could not otherwise be obtained. It will readily be imagined, that perfect vision is not to be obtained in this state of the eye: various reasons indeed concur against it: but it is a matter of importance for a person already totally blind to be rendered capable of finding his way, and of conducting himself from one place to another, which, by this operation, Mr. Pellier has done in different instances: and, so far as I know, the public are indebted to him alone for proposing it.

After the operation, the eye must be tied up, and treated in the same manner and with the same attention as is done after extracting the cataract; for where so much violence is done to the eye, if inflammation be not guarded against, much mischief may ensue from it.

In describing the method of dividing the iris, I have said that it should be done with scissars; for this membrane being loose and unsupported, it would yield before the edge of the sharpest knife. In the introduction of the director and scissars, care should be taken, in

passing them between the iris and lens, not to injure either the lens or its capsule; that is, when the disease is not complicated with cataract; for when the crystalline is opaque, it should be extracted.

In the treatment of the fistula lachrymalis, Mr. Pellier has much merit; for, with most operators, it often happens that no permanent advantage is obtained from any of the remedies that they employ, and even those who prove most successful very frequently fail. Mr. Pellier does not say that he always succeeds; but he does so in most instances; and I know that his method has often proved successful where others have failed.

In a confirmed fistula lachrymalis, the curative intention is, to form an opening between the lachrymal sac and the corresponding nostril. In Section XVIII. of this chapter, I have shewn that this is accomplished in different methods; by searching with a blunt probe to discover the natural passage: if this fails, by making an artificial opening through the os unguis; and when neither of these succeed, by leaving a tube or canula, either in the natural or artificial opening, for the purpose of conducting the tears to the nose.

As we know from experience, that the operation fails frequently from the passage becoming again impervious, and this whether it may have been done by opening the natural passage or by forming another, it would be the idea perhaps of most practitioners to leave a tube in the opening, were it not liable to one very important objection, namely, the uncertainty of its continuing fixed in its situation; for hitherto we have not been possessed of any certain method of preventing the canula either from rising and forcing its way out at the corner of the eye, or from passing down and coming out at the nose. In Plate XX. I have delineated various forms of tubes that have been used for this purpose; and of these, figs. 3. and 10. will frequently be found to answer: for when

pressed sufficiently into the opening through the os unguis, the bulge or prominence with which they are furnished above, for the most part prevents them from rising, while their conical shape prevents them from passing into the nose. I must however acknowledge, that they sometimes fail ; and that an invention of Mr. Pellier's answers better. Mr. Pellier asserts, that when properly introduced, it never fails ; and from any experience that I have had of it, I am clearly of the same opinion. In a patient of mine, on whom the operation was performed upwards of fifteen years ago, and in others where it was done nine or ten years ago, the tubes are still firm and immoveable, and answer the purpose of giving a free passage to the tears. Two representations of these tubes are given, in Plate XXV. figs. 5. and 6. They may be made either of gold or lead. Mr. Pellier commonly employs lead : but when of gold, the tube is less bulky ; and as this metal receives a finer polish, by which the opening through it is not so readily filled up with the tears, it ought, I think, to be preferred.

The peculiarity of form of Mr. Pellier's tubes consists in their having two projecting edges ; one at the top forming a kind of brim, corresponding as nearly as possible to the size of the lachrymal sac ; and the other near to the middle between this and the other end of the instrument ; by which means, when properly fixed in the passage where it is to remain, it is kept firm in its situation by the granulations that shoot out from the contiguous parts ; and which, by grasping as it were that part of the tube which lies between the two projecting edges, effectually prevent it from passing either up or down ; and hence that material inconvenience is avoided, of which practitioners, who employ cylindrical tubes, always complain.

It is necessary, however, to observe, that the utmost nicety is required in the use of these as well as of every variety of tube ; not merely in accurately adapting them to the size of the openings through which they

are to pass ; but afterwards in ascertaining the depth to which they should be pressed into the nose : for if a tube be either too small or too large for the opening through the os unguis, we may readily imagine that it will not answer ; and if it is pressed even in a trifling degree too far into the nostril, it will necessarily irritate the lining membrane of that cavity, so as to create much pain and inconvenience. The tubes represented in Plate XXV. are of a size both in length and thickness that answers for the most part of adults, but practitioners should be provided with various sizes.

The method of using them is this. After laying the lachrymal sac freely open in the usual way, the natural conduit of the tears is searched for, either with a firm probe, or with the conductor, Plate XXV. fig. 2. ; and Mr. Pellier asserts, that he never fails in finding it. As soon as this is discovered, the tube must be put upon the conductor, previously furnished with the compressor, fig. 3. as in fig. 4. ; and the tube should be of such a size that the conductor may fit it exactly in point of thickness, while the end of this part of the instrument is so much longer as to pass through the tube about the tenth part of an inch. The point of the conductor is now to be insinuated into the lachrymal duct ; and being pushed in till it reaches the nostril, which may be known either by passing a probe up the nostril, or by a few drops of blood being observed to fall from the nose, the conductor being no longer necessary, must be withdrawn, taking care to leave the compressor upon the upper brim or edge of the canula ; which must be firmly pressed down with it in the left hand, while the conductor is removed with the other. If this precaution be not taken, the canula would be brought out along with the conductor ; but this inconvenience is thus very effectually guarded against, while the same instrument serves more easily than any other to press the canula to a sufficient depth in the lachrymal duct ; a

point of the first importance in this operation ; for if the canula be not firmly fixed at the first attempt, it will not afterwards be so easily done.

This being accomplished, the compressor must be taken out ; and, with a view to discover whether the canula is at a proper depth or not, a little milk and water should be injected through it with the syringe, Plate XX. fig. 1. If the injection passes easily into the nostril, there will be no reason to doubt of the canula being properly placed ; but, if any obstruction occurs, there will be reason to fear that it is already pushed too far, and that it presses against the os spongiolum inferius ; in which case the canula should be withdrawn, with a view to shorten it, when it must be again introduced in the manner I have mentioned.

As the wound recently made in the sac will yield a large quantity of matter, it ought to be kept open for eight or ten days with a bit of soft lint spread with any emollient ointment, taking care to cover the whole with a compress of soft old linen, secured with a proper bandage. An injection of milk and water should be daily passed through the canula ; and at the end of this time, or whenever the suppuration is much diminished, and the fore looking clean and in a healing state, the dress of lint should be removed ; and a piece of court plaster being laid over the fore, it may in this state be left to heal, care being taken to renew the plaster occasionally, if any matter appears to form beneath it.

By this mode of treatment, cases of fistula lachrymalis that do not depend on disease of the contiguous bones, or on any latent disease of the constitution, will for the most part, as Mr. Pellier observes, be completely cured in three weeks, nay sometimes in a fortnight, which by the usual practice might require three, four, or five months.

In Plate XXVII. I have delineated the form of tube as well as all the other parts of the apparatus employed for this operation, by Mr. Wathen ; but although

the invention is ingenious, and may answer in a great proportion of cases, as Mr. Pellier's tubes appear to me to be better adapted to the form of the lachrymal passages, while his mode of introducing them is more simple, I think it probable that they will meet with a preference.

As I have been witness of the most complete success of Mr. Pellier's practice in this disease, I have considered it as a point of justice, not only to Mr. Pellier, but to the public, to give this full detail of it. If I had not indeed been convinced of the superior utility of Mr. Pellier's practice, and of the unreserved manner in which he communicated his knowledge of the diseases of the eyes, I should have deemed it impertinent to have given the preceding account of either to the public.

Since the first edition of this was published, the opinion which I then suggested, of the impossibility of extracting the capsule of the lens entire, has been the subject of much investigation: and as it now appears that it cannot be done, I still conclude that Mr. Pellier and others who supported a different opinion, have been deceived.

CHAPTER XII.

OF THE DISEASES OF THE NOSE AND FAUCES.

SECTION I.

Anatomical Description of the Nose and Fauces.

A MINUTE description of these parts is not necessary for our purpose; but a few remarks on their general form and structure will serve to elucidate the nature of the diseases to which they are liable.

The external prominent part of the nose is chiefly composed of bones and cartilages, which serve to protect the more deep seated parts of the organ of smell, and to form a kind of vaulted passage for the air to the throat.

This passage, divided by the septum nasi, forms the nostrils, which extend almost in a horizontal direction from the superior part of the upper lip backwards to the pharynx, where they terminate above the velum pendulum palati.

The superior and lateral parts of the arch of the nose, are formed by the nasal process of the os frontis; by the two ossa nasi; by the ossa unguis; and by an extensive process from each of the ossa maxillaria, to which the cartilaginous alæ of the nose, covered by the common teguments, are immediately attached.

The septum narium is formed by the nasal process of the ethmoid bone; the vomer; middle cartilage of the nose; and spinous processes of the palate and maxillary bones.

The under part of the cavity of the nose is anteriorly bounded by a horizontal process of the ossa max-

illaria, and backwards by a process of a similar form, from each of the ossa palati. The sphenoid and ethmoid bones form the boundaries of the posterior part of the nares.

Towards the upper part of the nose we meet with a very beautiful contrivance of nature for enlarging the organ of smell. In the superior part of each nostril, opposite to the septum, we find a spongy, cellular production of bone, proceeding from the os ethmoides, which, from their form, texture, and situation, are termed conchæ, ossa spongiosa, or ossa turbinata superiora : and beneath these, on the same side of the nostrils, are two bodies of a similar texture, which have likewise been supposed to be productions of the ethmoid bone, but of which there is no evidence ; which, from their situation, are termed ossa spongiosa inferiora. In some instances, two, and even three, small bones of this kind are met with in each nostril ; but this is not a frequent occurrence.

These bodies being prominent and irregular on their surfaces, give the nostrils a winding, or even a crooked appearance : but every practitioner will know, that they are so in appearance only ; inasmuch that a probe may be passed almost in a straight line from the external nares to the throat.

We meet with several openings which terminate in the nostrils, with some of which it is material for surgeons to be acquainted, namely, the ductus incisivi, which commence at the under and back part of the nostrils, and terminate behind the dentes incisivi of the upper jaw ; the sinuses of the sphenoid and frontal bones, which both open into the upper part of the nares ; the sinus of each maxillary bone, commonly termed the antrum maxillare, or highmorianum, which opens into the nose between the upper and under ossa spongiosa of the same side ; and lastly, the ducts of the lachrymal sacs, which in the preceding chapter I have had occasion to describe, and which terminate on

each side immediately beneath the os spongiosum inferius.

All the cavity of the nostrils ; the different sinuses I have mentioned, as well as the passages which lead to them ; the whole surfaces of the ossa spongiosa, and even the fauces, are covered or lined with a thick soft membrane, which, from its affording a plentiful secretion of mucus, is commonly termed *membrana pituitaria*, or *membrana Schneideri*, from Schneider, the first anatomist who gave an accurate account of it.

This membrane appears to be a continuation of the cuticle. Towards the external nares, near to its connection with the epidermis, it is exceedingly thin ; but as it proceeds backward upon the septum nasi and ossa spongiosa, it acquires a considerable degree of thickness ; and again becomes thin as it proceeds to line the different sinuses.

The cavity of the nose, as I have already remarked, is separated from the mouth by a plate of bone, formed by a process from each of the ossa maxillaria, and by the ossa palati. To the posterior edge of the last mentioned bone there is a firm membrane connected, termed the velum or *valvula palati*, formed by a junction of the common membrane of the mouth, with a continuation of the *membrana Schneideri*, together with several muscular fasciculi, intended for the motion of this and the contiguous parts. This membrane, as it stretches back from the palate, falls down and terminates in the uvula immediately above the root of the tongue ; by which it is not only well fitted for preventing the food, during mastication and deglutition, from passing up to the nose, but for conveying back to the pharynx all such parts of the mucus furnished by the membrane of the nose, and contiguous sinuses, as are not discharged by the external nares.

On each side of the throat, at the termination of the velum pendulum palati, there is situated a prominent glandular substance, commonly termed the amygdalæ or almonds of the ear. They are naturally of a

soft, yielding texture ; and in general they have excavations of different degrees of deepness on various parts of them, which, by those not acquainted with the usual appearances of these parts, are often mistaken for ulcerations. On looking farther into the throat, along the course of the tongue, a thin, elastic, cartilaginous body is observed, termed epiglottis, which is so placed as to prevent the food from falling into the trachea in its passage from the mouth to the pharynx, a wide capacious bag, which terminates in the œsophagus, and occupies all that part of the throat that is seen on looking into the mouth.

From this description it is evident, that the pharynx is furnished with several openings or outlets. Below, it terminates in the œsophagus ; anteriorly, it communicates directly with the mouth ; and from the superior part of the bag it has a free direct communication with the posterior openings of the nostrils.

I shall now proceed to consider the diseases of these parts, and the operations that are practised for them. The subjects are, hemorrhagies from the nostrils ; ozæna ; imperforated nostrils ; polypous excrescences in the nose and throat ; extirpation of the amygdalæ and uvula ; scarifying and fomenting the throat.

SECTION II.

Of Hemorrhagies from the Nostrils.

THE internal parts of the nose are supplied almost entirely with blood from the internal maxillary artery : in general, the branches of this artery that go to the nose are so small, as to render a division or rupture of them an object of little importance ; but, in some instances, it is otherwise, and hemorrhagies occasionally occur from these parts that give much anxiety and distress to practitioners, and prove very haz-

ardous to patients. They have sometimes even baffled every attempt that could be made to restrain them ; so that, however inconsiderable this evacuation may in a great proportion of instances be, it ought, in every case, to be treated with attention.

In a great proportion of cases, a proper application of cold puts a temporary stop to the discharge ; and in general, any future returns of it may be prevented by bloodletting, a moderate use of cooling laxatives, and a low regimen.

In order to obtain all the advantages that may be derived from cold, it must be employed in various ways, and to a considerable extent. The patient should be placed in a large apartment, with a current of cold air passing through it : his food and drink ought all to be cold : his face should be frequently bathed, and even immersed, in cold water, or in cold water with a proportion of vinegar : the mouth should be kept filled from time to time with a cold solution of alum, or any other astringent : compresses, wet in any liquid of this kind, should be applied over the nose : when in bed, the patient should be lightly covered ; and he should sleep with his head as high as possible.

By these means being duly continued, nasal hemorrhagies may in general be removed ; but in some instances no benefit is derived from them, the flow of blood not being in any degree diminished by whatever care and assiduity they happen to be applied.

In such cases, compression of the ruptured blood vessel is alone to be depended on ; but when deeply seated in the nostril, the application of pressure is both difficult and uncertain. It sometimes happens that a doffel of lint passed into the bleeding nostril will put an immediate stop to the discharge. This, however, is rare ; for the extent and diameter of the passage through which the doffel is pushed being very unequal, the effect produced by it must likewise be so :

hence we cannot place much dependence on this method of applying pressure.

In former editions of this work, when treating of the discharge of blood from the anus in cases of piles, I advised the application of pressure by the introduction of a piece of gut, tied at one end, into the rectum, and by filling it at the opposite extremity with any cold liquid, to increase the pressure by forcing up the liquid, and securing it with a ligature. The same remedy may be employed in hemorrhagies from the nose. It has already been successfully used in a few instances; and may frequently, I think, be employed with advantage. A piece of hog's gut, previously dried and moistened again, answers best. One end of it firmly tied with a bit of small packthread, should, by means of a probe or director, be pushed along the whole course of the nostril from which the blood is discharged, to the upper end of the pharynx. The gut should now be filled with cold vinegar, water, or any other cold liquid, by means of a syringe inserted at the end hanging out at the nostril; and as much being injected as the gut will admit, the whole should be pressed as far up as possible, and secured in this situation with a ligature.

In this manner a very considerable degree of pressure may be applied; and some advantage may be derived from the application of cold directly to the vessel from whence the blood is discharged. In some instances, however, even this may fail, owing to the ruptured artery being so situated that pressure cannot in this manner be directly applied to it. In such circumstances, other means must be employed, and the following very commonly answer.

Let the curved instrument, fig. 4. Plate XXVI. be inserted at one of the nostrils with a piece of catgut or firm waxed thread contained in it; and being conveyed into the throat, the ligature must be laid hold of with forceps or the fingers, and taken out at the mouth; when the instrument is to be withdrawn, and

again introduced at the other nostril with a ligature of the same kind, to be likewise taken out at the mouth. A bolster of soft lint, of a sufficient size for stuffing or filling the posterior nares, is now to be firmly tied to the two ends of the ligatures hanging out at the mouth, when the opposite ends of them must be pulled forward at the nostrils till the cushion of lint is firmly applied to and fixed in the upper part of the pharynx; when a compress of linen must be applied to each nostril, and fixed in this situation by tying the ligatures over it. The patient should now be laid to rest. If the bolsters of lint have been properly applied, no blood will escape either from the posterior or anterior nares; any blood that is effused into the nostrils will soon coagulate, and thus a stop will be put to the hemorrhagy. It is evident, however, that in order to insure success, the bolsters of lint should not only be accurately applied, but continued for a length of time sufficient for admitting of the healing or reunion of the ruptured blood vessels.

In fixing the bolster of lint in the back part of the mouth, I have advised two ligatures to be employed; one to be passed through each nostril. In this manner it may be applied not only more firmly, but more equally, than by the usual method of passing only one ligature through that nostril from whence the blood is discharged. I also think it right to remark, that a ligature should be attached to the bolster of lint in the pharynx, of a sufficient length to hang out at the mouth, by which the bolster may be withdrawn on the hemorrhagy being stopped: otherwise, when the bolster is firmly fixed behind the velum pendulum palati, it cannot be removed but with much trouble, both to the surgeon and patient, of which I have met with different instances: in one of these, after various attempts had been made for taking the bolster away, it was allowed to remain for three or four weeks, till it fell into the throat during sleep, when it nearly suffocated the patient before being got out.

SECTION III.

Of an Ozæna.

THE term ozæna has in general been applied to such ulcers of the nose as are foul; that discharge a fetid matter, and are attended with a carious state of one or more of the bones; whilst by some the same general denomination of ozæna is applied to every ulcer in the nostrils, whether attended with caries or not. At present I shall adhere to this last acceptance of the term.

Every catarrh affecting the lining membrane of the nose, serves in a greater or less degree to excite an inflamed state of the parts in which it is seated. But this in general terminates easily, and the inflammation is removed by a plentiful discharge either of mucus or thick yellow matter. In some instances, however, even after every other catarrhal symptom is removed, this discharge of matter continues obstinate, either from ulceration alone, or perhaps from ulceration conjoined with fulness and swelling of the lining membrane of the nose.

Exposure to cold is to be considered as the most frequent cause of this state of the disease; but external violence of every kind that terminates in an inflamed state of the membrane of the nose, such as the application of acrid irritating substances, blows and bruises, may likewise tend to produce it.

When the system is not otherwise diseased, this is the most simple variety of an ozæna; and as in this state we suppose it to be perfectly local, local remedies ought alone to be employed.

In this state of the disease, we trust chiefly to the use of drying and astringent applications. Of these, decoctions of walnut-tree leaves, or of Peruvian or oak bark, mixed with a solution of alum, solutions of

white vitriol, and strong saturnine solutions, are perhaps equal if not preferable to any. Brandy or any other ardent spirits diluted with water, and lime water, may likewise be employed with advantage.

Dossils of soft lint soaked in any of these should be introduced into the nostril three or four times daily, and pushed up so as to be brought in contact with the diseased parts; and every night at bedtime an ointment should be applied, prepared with a large proportion of calcined zinc or lapis calaminaris.

By a due continuation of these means, almost every local disease, depending on ulceration of the membrane of the nose, will at last be removed. But instances have occurred of other diseases being mistaken for sores in the nose, and of the running produced by them continuing to resist every effort that could be made for removing it. This is particularly the case with collections of matter in the antrum maxillare.

In the anatomical description I have given of these parts, we have seen, that there is naturally a passage or opening from the antrum maxillare into the nose immediately below and covered by the os spongiosum inferius of the same side. In collections of matter in this cavity, when large in quantity, it is occasionally discharged by this outlet into the nose in every posture of the body, and almost always when the patient lies on the sound or opposite side, if the passage be not obstructed. The method of treatment best suited for the removal of collections in the antrum maxillare, will be the subject of a section in the next chapter: at present I have only to say, that in diseases attended with a discharge of matter from the nose, practitioners should be on their guard, lest, by mistaking one disease for another, mischief may be done; not only by a misapplication of remedies, but by those means being omitted from whence alone any real advantage could be derived.

When, again, the matter discharged from an ulcer in the nose is thin, fetid, and of a brown or somewhat

black colour, as this gives cause to suspect that the contiguous bones are carious, it would be in vain to expect a cure till these are removed. We may in general know that caries exists, by the peculiar fetor of the matter which the fores afford : but when any doubt remains of this point, we have it commonly in our power to have it ascertained by the introduction of a probe.

As a carious state of the bones of the nose occurs more frequently from lues venerea, than from any other cause, this should be kept in view in every symptom of this kind : and whether we may be able to trace it with certainty as a symptom of this disease or not, whenever there is the least cause for suspicion, the patient should without hesitation be put on a long continued course of mercury. From whatever cause the disease may have arisen, mercury will not probably do harm ; and as I have seen it prove useful even where no venereal taint has existed, I now in general, in all such cases, advise it immediately.

In the mean time, the local treatment of the fores should not be neglected. The parts should be bathed from time to time with one or other of the decoctions I have mentioned ; and as the soft spongy bones of the nose are apt, when carious, to produce troublesome fungous excrescences, ointments, impregnated with corrosive applications, should be employed occasionally ; and of these there are none I have ever employed that answer so well as prepared verdegriſ, calomel, or red precipitate. A general prejudice indeed prevails against the use of remedies of this kind in diseases of the internal parts of the nose, from a fear of their doing harm, by irritating the very sensible membrane to which they are applied. There is no good cause, however, for this timidity ; and I can say from experience, that ointments, such as I have mentioned, of a strength sufficient for keeping down fungous excrescences, may be employed with much safe-

ty, and without any risk of hurting the contiguous parts. It is scarcely necessary to remark, that in the use of remedies of this kind, some caution is necessary, in adapting the strength of the article to the parts to which it is to be applied. The internal surface of the nose will not bear the same degree of irritation that may with safety be applied to some other parts of the body; but it will bear the application of corrosive ointments more strongly impregnated than is commonly imagined. A liniment composed of wax and oil, with an eighth or ninth part of red precipitate, may be employed with safety, and the corrosive powers of it can be occasionally increased or diminished; calomel may be used in a larger proportion, and twenty grains of verdegriis may be added to an ounce of liniment. The growth of fungous excrescences being thus prevented, and the sores kept clean by the frequent use of an astringent antiseptic wash, the passage of the nostril will be preserved pervious, the disease will not spread so readily, and the carious bone will be more quickly separated and thrown off than when these circumstances are overlooked.

Till the caries is removed, no permanent cure will take place. The treatment therefore that I have just pointed out should be continued till this is fully accomplished. Indeed, after a sufficient quantity of mercury is exhibited for the removal of any latent venereal taint that might exist in the system, all that we can expect further from art, is to assist in the manner I have advised, in effecting a separation of such bones as are diseased. This being done, the sores will assume a milder aspect, and will in general heal by a continuance of the astringent applications alone.

This is the practice which by experience I have found to answer best in cases of ozæna. It must, however, be acknowledged, that no remedies with which we are acquainted will at all times succeed. This kind of ulcer proves always tedious, not only from the difficulty of reaching the sore with proper

dressings, but from the ossa spongiosa, when they become carious, being always slow in exfoliating. When however, the system is not otherwise diseased, the means that I have mentioned will very commonly succeed at last.

SECTION IV.

Of Imperforated Nostrils.

CHILDREN are not unfrequently born with the vagina or anus in an imperforated state; and although we know of no reason why the nostril should not in like manner be often imperforated at birth, we are certain that it is a rare occurrence. Every practitioner, however, must have met with some instances of preternatural adhesions of the nostrils, the consequence of confluent smallpox, of burns, or venereal sores.

Adhesions of this kind are in various degrees. In some cases the nostrils are only slightly contracted, without producing any material impediment to respiration: in others, they are so much drawn together, as hardly to admit a common probe or a small quill: and in a few, the passage is entirely obliterated.

In cases of this kind, it is the object of surgery to remove the cause of obstruction as completely as it can be done, and when an opening is left, however small it may be, much aid may be derived from it in effecting our intention. A small grooved director being passed into the opening, it may be easily enlarged to its natural size, by running a small bistoury or scalpel into the groove, and thus dividing the parts which adhere: but when there is no passage whatever, whether the effect of natural conformation, or of any other cause, we should, in the first place, by slow dissec-

tion with a small scalpel, endeavour to discover one of the nostrils, taking care, with as much caution as possible, to keep the opening in a proper direction, between the septum nasi and the contiguous external cartilage : and the passage being once discovered, it must be enlarged to the natural size in the manner I have mentioned, by the introduction of a director and bistoury. This being done in one nostril, we endeavour, by the same cautious dissection, to discover the other.

A clear opening being thus formed in each nostril, our next object is to preserve it of a full size, and to prevent the parts from adhering again ; which by experience we know they would do, and which much attention alone can prevent.

The introduction of dossils of lint of an adequate size, or of any other soft substance, retaining them till there is no risk of future adhesions, and taking care to withdraw them daily, in order to cleanse or renew them, might answer the purpose : but metallic tubes, adapted to the size of the openings, while they admit of free respiration through the nostrils, serve to distend the parts with more equality, and are more easily retained in their situation. Before being introduced, they should be covered with soft leather spread with any emollient ointment ; by which they sit with more ease, and are more readily withdrawn at the different dressings.

Various forms of tubes have been recommended for this purpose. Those represented in fig. 2. Plate XXVI. are of a form that answer perfectly well ; and they are easily retained either with a bandage round the head, or with adhesive plasters for attaching them to the contiguous parts. They should be continued as long as any degree of foreness or excoriation remains in the course of the incisions ; for if withdrawn before the sores are healed, new adhesions or contractions would very commonly ensue.

It sometimes happens from burns, as well as from the confluent smallpox, that along with a contraction, or perhaps a total obliteration, of one or both nostrils, an adhesion is produced between the nose and skin of the upper lip. In this case, the adhesion of the lip to the nose should, in the first place, be removed with a scalpel; and the sore thus produced should be firmly cicatrised before we attempt to open the nostrils. It is scarcely necessary to remark, that, during the cure, the sore should not only be kept properly covered, but with a view to remove any improper contraction which the lip may have acquired, it ought at each dressing to be tied down with several turns of a double headed roller passed round and over the head.

SECTION V.

Of Polypi in the Nose and Throat.

THE lining membrane of the nose is liable to excrescences, which, from their supposed resemblance to insects of that name, have commonly been termed polypi. Every part of the nasal cavity, and of the back part of the throat, is liable to these excrescences; but most frequently they arise from that part of the membrane of the nose that lines or covers the ossa spongiosa. For the most part they are confined to one side of the nose, and they do not commonly appear so far back as the throat; but in some instances they occupy both nostrils, and in others they are so large, as to be distinctly perceived on looking into the pharynx. In some cases, indeed, they are found to arise in the pharynx.

The first warning that a patient commonly receives of this disease, is a partial loss of smell, attended with a sensation of fulness or obstruction in some particular part of the nose, very similar to what is experienced

from the stuffing of the nostrils in a common cold or catarrh. This continues to increase, till a small tumor or excrescence is perceived in one, and sometimes in both nostrils; which in some instances never descends farther than to be merely perceptible on looking into the nostril; while in others it falls down upon the upper lip, and at the same time perhaps pushes back into the throat.

In some, this elongation of the tumor continues steady and permanent, while in others it retracts altogether within the nostrils in dry weather, and protrudes only in rain, or in thick hazy weather. Indeed, the influence of weather on the size of these excrescences is often astonishing. I have known some patients who in clear dry weather were not known to labour under the disease, in whom the tumors protruded to a considerable length on the least tendency to moist weather.

These tumors are of various degrees of firmness. In a great proportion of cases they are soft and compressible, but in others so firm as to be equally hard with cartilage: all kinds of them are apt to bleed on being fretted or roughly handled; but it is the soft spongy kind only that are so remarkably affected by changes of weather.

The colour of these tumors is likewise variable: for the most part they are somewhat pale and transparent, but in some instances they are of a deep red; and, so far as I have yet had opportunities of observing, I would say, that there is some connection between their colour and texture. The experience of others may lead to a different conclusion; but in the course of my observation it has uniformly happened, that the soft compressible polypus has been of a pale complexion, while those of a firmer texture have always been of a deep red.

In the commencement of polypus, the pain is always inconsiderable; and in the softer kinds of it there is seldom much pain, even in its most advanced stages. But polypi of a harder nature become painful as they

increase in size, particularly on any cause of irritation being applied to them. In some instances they become unequal and ulcerated over their whole extent. In this state, considerable quantities of a thin fetid matter are discharged; and if a cure be not obtained by extirpation, they are now very apt to degenerate into cancer. It is proper, however, to observe, that it is the firm fleshy kind of polypi only that are apt to become cancerous, and that this change rarely or never happens with those of a soft texture.

But although the softer kinds of polypi seldom end in cancer, and are rarely productive of much inconvenience in their early stages, or as long as they are confined to either of the nasal cavities; yet when more advanced, they are often attended with much distress. Besides the trouble arising from their falling down upon the lip, they sometimes pass so far back into the fauces, as not only to impede deglutition, but to obstruct respiration; and in some instances they become so large, as not only to distend the softer parts of the nostrils, but to elevate and even to separate and dissolve the firm bones of the nose. This, indeed, is not a common occurrence; but every practitioner must have met with it, as I have done in different instances.

Various opinions are met with in authors of the cause of polypi. By some they are said to arise most frequently from scrofula; while others imagine, that they proceed most frequently from lues venerea.

I will not say that polypi do not occasionally occur along with the venereal disease and scrofula. They may even be met with as symptoms of these diseases. But in such instances I would consider the general disease of the system in no other light than as an occasional or exciting cause of the local affection, for in almost every case of polypus a local injury may be traced as the cause of it; and from every circumstance relating to the disease, I conclude, that it is always local and circumscribed. For even where a polypus originates from lues venerea, this particular symptom

is so far of a local nature, that it remains fixed and permanent after the general taint of the system is removed. Nor is it acted upon by any quantity of mercury that is given.

All the harder kinds of polypi may probably originate from the same causes which produce tumors of a similar texture in other parts of the body ; but in most instances they appear to be connected with, and even to proceed from, a caries of the bone beneath ; and it is this chiefly which renders them more hazardous, and of more difficult cure than those that are soft, which, in general, I conceive to be produced by a mere distention or relaxation of the *membrana Schneideriana*. When any portion of this membrane becomes inflamed, either by the effects of cold or from external violence, if in this state any part of its surface is ruptured or eroded, as frequently happens from picking or blowing the nose too forcibly, a degree of weakness or relaxation is produced, that is apt to terminate in a fulness or prominence of the injured parts ; and this being increased by every succeeding cold, the disease we are now considering comes in this manner to take place.

The further progress of the disease may depend on various causes ; but in general it will advance quickly or slowly, according as the parts affected are more or less liable to inflame. Thus I have known various instances of polypi remaining small and stationary for a great number of years, when the patients have not been much exposed to the open air ; while in poor people, who are exposed to every inclemency of weather, and who are therefore more liable to frequent returns of catarrh, they advance with more rapidity.

In the treatment of every disease, it is a point of importance to be able to form a just prognosis, not only of the manner in which the symptoms may probably terminate, but of the effects which may result from the remedies that are to be employed for them ; and

in no instance is this more desirable than in polypous excrescences of the nose.

By some we are led to conclude, that polypi are always doubtful with respect to their termination ; that for the most part they are even of a dangerous nature ; and therefore that we should consider every person in whom they occur as in a state of hazard : whilst others assert, that although they may occasionally excite some inconvenience, yet they are seldom or never attended with risk.

Some, again, are so timid in the treatment of polypi, as to suppose that they ought never to be touched ; and allege, that there is more chance of rendering them worse than better, by any operation we can advise for removing them ; whilst by others we are told, that they may be taken away with safety.

This difference of opinion in regard to the nature of polypi, and of the effects of the remedies employed for them, has arisen in a great measure from authors not having distinguished the different kinds of these excrescences with such precision as they ought to have done : for while in one variety of the disease there is little risk to be dreaded, and no great cause to doubt of our being able to remove it ; in others, there is undoubtedly much hazard, and great reason to fear that no remedies whatever will prevent a return of it.

I have already observed, that polypi are of various degrees of firmness ; and all the observation that I have been enabled to make of them, has led me to conclude, that in general the risk with which they are attended, is nearly in proportion to their firmness. The soft compressible polypi are not only less painful than the others, but may at any time be removed with more safety. They are not usually indeed attended with pain ; and it seldom happens that any material inconvenience occurs from their extirpation : but the firm fleshy kind of polypi are in general not only painful, but more apt to return after being extirpated. In forming an opinion, therefore, of the probable event

of polypi, this circumstance of texture deserves particular consideration. In a soft compressible polypus, if the patient is healthy, we may in every instance give a favourable prognosis; for as long as the tumor is of moderate size, it seldom proves troublesome, and therefore ought not to be meddled with; and again, when, by acquiring additional bulk, its removal becomes necessary, it may always be advised with probable hopes of success. But, on the contrary, in polypi that are fleshy, and especially when of a firmer texture than this, the patient or his friends ought always to be informed of the risk being considerable; for it frequently happens that they cannot be entirely removed; and even when this is easily and completely practicable, they are apt to regenerate, and in some instances, as I already observed, to end in cancer. In all such cases, therefore, a guarded prognosis should be given; otherwise, if the disease should afterwards return, the operator would be justly blamed, while the operation itself would fall into discredit.

Indeed some practitioners are so averse to this operation in all cases of firm or hard polypi, that they always decline to advise it. As long as they remain stationary, and do not give pain, if they do not obstruct breathing or deglutition, they ought not to be touched: but whenever they become painful, especially when they have acquired such a bulk as to obstruct either the passage to the stomach or lungs, we ought certainly to endeavour to extract them, if this be not already impracticable by their adhering through the whole of their extent to the bones of the nose, and by these being rendered carious; which, in the late stages of the disease, is very frequently the case.

All the softer kinds of polypi, which are liable, as I have already described, to be affected by the state of the weather, may frequently be prevented from becoming large by the use of astringent and escharotic applications, particularly by a strong solution of alum or white vitriol, the powder of calcined alum, a decoc-

tion of oak bark, or the application of vinegar or ardent spirits. By one or other of these being applied from time to time over the surface of the tumors, I have known different instances of their increase being checked for a great length of time ; and, in some cases, where the remedy has been freely employed, they have at last shrivelled and become less. It must be acknowledged, however, that escharotics seldom or never accomplish a cure ; but it is a matter of no small importance, our being able, by gentle means, to render any painful operation unnecessary.

On the first appearance, therefore, of a polypus, we ought, by a free use of some astringent or escharotic application, to endeavour to prevent its farther increase ; but when this does not succeed, we are to consider by what mode the tumor may be most effectually removed.

Various methods have been proposed for the removal of polypi : namely, the use of caustic or corroding applications ; the actual cautery ; the passing of a seton or cord through the diseased nostril ; excision with a scalpel or scissors ; the application of a ligature round the neck of the tumor ; and evulsion, or extraction by a proper application of forceps.

An ignorance of the circulation of the blood, and of the easy method with which we are now acquainted of putting a stop to hemorrhagies, led in earlier times to the practice of removing tumors wherever they were seated, by corrosive applications, and even by the use of the actual cautery. If this practice was considered as necessary in other parts of the body, it is not surprising to find it proposed for the removal of polypi in the nose, where the effect of hemorrhagies was more dreaded. Cauterising irons were therefore invented for this purpose, together with metallic tubes for conducting them. But even with the utmost attention the diseased parts cannot be destroyed without injuring the sound. Remedies of this kind are therefore very apt to do harm, so that they are now very

generally laid aside ; as are likewise all kinds of strong corrosive applications, which are equally liable to uncertainty, by their being apt to spread to the contiguous sound parts of the nose and throat.

As some have imagined that polypi may be removed, by inducing suppuration over their surfaces, it has been proposed to insert a cord of silk or cotton into the diseased nostril, and one end of it being taken out at the mouth, by daily drawing it, and covering that part of it that remains in contact with the tumor, with a slightly irritating ointment, thus to create some degree of inflammation and consequent suppuration over it.

I will readily allow, that in this manner a plentiful flow of matter may be excited ; but it is not probable that this would have much influence on the size of the tumor. Till of late indeed, it was imagined, that the formation of pus is necessarily attended with a dissolution of the solid parts in which it occurs. Upon this principle Mr. Daran and others endeavoured to explain the operation of bougies in obstructions of the urethra ; and a similar idea suggested the remedy of which we are now speaking, in polypous excrescences of the nose. But it is now known, as I have elsewhere fully shewn,* that the dissolution of solid parts is by no means necessary for the formation of pus. It is also known, that in diseases of the urethra, bougies prove effectual only by their form, and by the pressure which they produce ; and I have no difficulty in saying, that it is in this manner only, by which a cord, if it ever proves useful, can have any effect on polypi of the nose. As the passage of the nostrils is very unequal, being wider in one part than another, and as the roots of polypi are frequently so situated that no pressure can be applied to them, I am not of opinion that they can ever be removed by the action of a seton passed through the nose, as many have im-

* Vide Chapters I. and III.

agined. But after the extirpation of polypi in the manner I shall hereafter point out, if their roots are not entirely removed, some advantage may be derived from our endeavouring in this manner to clear the passage more completely. It was for this purpose solely, I may remark, that the practice we are now considering was first proposed by that judicious observer M. Le Dran. But although it might, in this manner, sometimes prove useful, yet from being troublesome in the application, it has seldom been employed. We shall have occasion, however, in a subsequent part of this section, to speak of it again.

In other parts of the body, the removal of tumors by excision is universally preferred to every other method; and it would likewise be so in polypi of the nose, were it not for their inaccessible situation. We seldom indeed find them situated so as to render this mode of treatment practicable; for although scalpels and scissars of various forms have been invented for this purpose, the roots of polypi are in general seated so high in the nostrils, and the passage is for the most part so completely filled by the tumor itself, as to render it always difficult, and often impossible, to remove them by excision.

But when it is found that the tumor rises in the under part of the nostril, and when the point of a scalpel can easily reach the root of it, we ought, without hesitation, to employ this method of taking it away, even in preference to that by ligature: for in this manner the whole of the tumor may be more effectually removed; and in this situation, there is no reason to be afraid of hemorrhagies, as compression can be readily applied to any blood vessel that may be cut in the under part of the nostrils. We rarely find, however, as I have observed already, that a polypus is seated so far down in the nostrils as to render this method of treatment practicable.

It therefore appears, that all the means we have yet considered for the removal of polypi in the nose, are

either inadequate to the effect, or altogether inadmissible; and hence we are obliged to employ either the method by ligature, or that by extraction with the forceps.

As the removal of polypi by tearing or twisting them off, is attended with much more pain than the application of ligatures round their necks, the latter would always have been preferred, if it had been considered as equally practicable. And as we now know that it can be done in a very safe and easy manner, it will probably in future be very generally employed. The method to which I allude, is that which Monsieur Levrette, of Paris, first recommended, for the removal of polypi in the vagina, and which we now find may be used with equal propriety in polypi of the nose and throat. The following is the method of applying it in the throat.

Fig. 1, Plate XXXI. represents a piece of pliable silver wire passed through a double canula; the wire being sufficiently long when double to admit of its passing through the nose in the pharynx. Let the wire be taken from the canula, and the doubling at the end of it be slowly and gently insinuated through one of the nostrils: as soon as it appears in the throat, the operator, with his fingers inserted into the mouth, must open the double sufficiently for passing it over the pendulous extremity of the tumor; and having pressed it down to the neck or root of it, the two ends of the ligature hanging out at the nostril must be again passed through the canula; which is now to be pushed back along the course of the wire, till it comes in contact with the root of the polypus. The fingers should still be continued in the throat, to retain the ligature at the root of the tumor; and the canula being placed in the manner I have advised, the wire must be drawn tight; and the ends of it being fixed on the wings or handle of the canula, as in Plate XXXII. fig. 1, it must be left in this situation till the following day, when being again drawn somewhat

tighter, and this being daily repeated, the tumor, will fall off sooner or later, according to its size. When small, it sometimes drops off in the course of the second day; and tumors even of a large size often come away on the third or fourth. It is better, however, to make the compression more gradual; for, when the wire is drawn with much force, instead of acting as a ligature, and removing the tumor by compression, it removes it too quickly, by cutting it across, and may thus be equally productive of hemorrhagies, as if the operation had been done with a scalpel.

In this manner, all those polypi may be removed, which either originate in the throat, or that proceed back from the nostrils into the fauces; and the practice may be extended even to those that are deeply seated in the pharynx, if the ligature can be properly applied over them, either with the fingers, with the assistance of forceps, or with an instrument, such as is delineated in Plate XXXIII. fig. 3. Some instances, indeed, have occurred, of excrescences seated too deep in the œsophagus, for admitting of ligatures being used in this manner; nor is it admissible even where the upper part of the tumor is accessible, if the base or neck of it be so low down as to prevent the ligature from being applied to it. In the third volume of the *Physical and Literary Essays of Edingburgh*, there is a case related, in which a very ingenious method was put in practice by the late Mr. Dallas, for surrounding deep seated polypi with ligatures; and although instances of such excrescences are rare, yet, as they are sometimes met with, I think it right to give a delineation of the instrument which in this instance was successfully employed.

In this case both breathing and deglutition were impeded by a large fleshy excrescence in the œsophagus, a considerable portion of which was thrown into the mouth, by every exertion to vomit; but it soon retracted and remained concealed within the pharynx till vomiting or retching was again excited. This

portion of the tumor, which occasionally protruded, was removed by the method to which I allude, and which I have more particularly described in the explanation to Plate XXXIV. The patient was in this manner relieved from much inconvenience and distress; but another branch of the tumor that extended towards the stomach, becoming afterwards very large, he died of the effects of it in about two years from the operation.

I think it right to remark, that this patient might probably have been saved by the use of the ligature and double canula, such as I have described, and that in similar cases it is to be considered as perhaps the best means of relief. When a polypus is suspected to have formed in the œsophagus, if no part of it is observed to protrude into the pharynx, there will be much cause to imagine that it proceeds down towards the stomach; so that, if the double of a piece of flexible wire be pushed down the œsophagus, the pendulous part of the tumor may be laid hold of in withdrawing it; or, if one attempt should fail, other trials may safely be made with it: and as soon as the double of the ligature is found to be firmly fixed, all that portion of the tumor which it surrounds may be easily removed by the application of the double canula, in the manner I have advised. It is proper, however, to observe, that the ligature and canula should both be carried through one of the nostrils into the œsophagus; for in this manner they will not prove so troublesome as when passed through the mouth, and they may be applied with equal ease and advantage. For this purpose the canula must have a slight degree of curvature, as is represented in Plate XXXI. fig. 2.

In a great proportion of cases, ligatures may be applied round polypi of the back part of the nose and throat, in the manner I have advised, and without interrupting respiration; but when deeply seated in the œsophagus, and on all occasions when the application of the ligature is difficult and tedious, it is proper to

secure an easy and free respiration during the operation, by previously advising bronchotomy. By this no additional risk is incurred, for it may with ease and safety be accomplished; and it puts it in our power to finish the operation more perfectly than we otherwise could do. It is likewise proper to remark, that although the operation may often be done without any assistance from a speculum oris, yet, whenever it proves tedious, and when the ligature cannot be easily applied, this instrument should be employed.

I have now to mention the method of applying a ligature to a polypus seated in the anterior part of the nose, and which, instead of passing back into the pharynx, proceeds down one of the nostrils towards the upper lip. Let the double of the ligature be passed over the most depending part of the polypus, and be slowly pushed up to the root of it with the slit probe, Plate XXXIII. fig. 2. The probe being given to an assistant to preserve the ligature in this situation, the two ends of it must be passed through a double canula; which being inserted into the nostril on the opposite side of the polypus, and being pushed easily along till it reaches the root of it, the ligature must now be drawn so tight as to make some impression on the root of the tumor, when the ends of it must be tied to the wings of the instrument, and daily pulled somewhat tighter, till the tumor drops off.

In this manner almost every polypus in any part of the nose may be extirpated. Those who have not seen it put in practice, may be apt to doubt of this assertion: but a few trials will shew that it is not only the most effectual method, but the safest and easiest that has yet been proposed for removing polypi of every kind: it also has the advantage over every other method of applying ligatures upon polypi in the nose, of answering equally well in the large as in the smaller kinds of them; and it may even be applied where the tumor is so large as to distend the nostril to a consid-

erable size. In plate XXXIII. fig. 1. there is delineated a remarkable form of a polypus extirpated in this manner, under the direction of Dr. Monro, who was the first, I must observe, who put in practice this method of removing polypi from the nose and fauces. This polypus filled the nostril completely; to such a degree, indeed, that it could not have been removed in any other manner; not even with forceps, for the blades of the instrument could not have been inserted.

Besides this, another method has been proposed of applying ligatures round polypi in the nostrils: by introducing a ligature through the nostril in which the tumor is seated, pushing it back to the throat, and passing it in such a manner, that the doubling may include the root of the polypus, if the opposite ends of it be taken out at the mouth, they may be sufficiently twisted, it is alleged, for removing the tumor.

In a few cases this might possibly answer, but it would often fail: I think it right, however, to mention it, from its being recommended by a very judicious practitioner, Mr. Cheselden. Figure 2. Plate XXXII. exhibits a representation of a polypus surrounded with a ligature in this manner.

Various forms of forceps have been invented for the purpose of removing polypi. Those that answer the intention best, and now most generally used, are represented in Plate XXXV. Those of a straight form are intended for extracting polypi by the anterior nares, and the crooked forceps are employed by some for the removal of those excrescences which pass into the throat behind the uvula. I have shewn indeed that polypi of this kind may be more easily removed with ligatures, but I think it right to delineate such forms of forceps as are used by those who prefer a different method.

In proceeding to extract a polypus with forceps, the patient ought to be firmly seated, with his head leaning back, and supported by an assistant behind; and as it is of much importance, our being able to dis-

cover, as nearly as possible, the origin of the excrescence, some advantage may be obtained from the face being placed in such a manner that the light of a clear sun may fall into the nostril.

In the ordinary method of performing this operation, the surgeon now takes the forceps, fig. 2. Plate XXXV. and inserting one of the blades on each side of the polypus, he carries them easily along till he brings their points as near as possible to the neck of it, when he lays hold of it firmly, and endeavours to extract it entire, either by pulling directly downwards, or by moving the forceps from one side of the nostril to another; or, as some more properly advise, by turning or twisting the polypus round, till it is completely separated. By this last method I think it probable, that the root or attachment of the excrescence will be more readily loosened than in any other way, at the same time that that part of the lining membrane of the nose will not be so much injured as when the tumor is torn away by being pulled either laterally or in a perpendicular direction downwards.

When a polypus is of a firm texture, if the operation is properly conducted, we may frequently be able to bring it all away at once: but when soft and yielding, it commonly requires repeated applications of the forceps; and we should never desist, as long as any portion of it remains that can with propriety be removed.

It is proper, however, in this place, to observe; that the first application of the forceps is commonly attended with the discharge of so much blood, that beginners are apt to desist before the operation is nearly finished, from their being afraid of fatal consequences from the hemorrhagy; but this ought not in general to be regarded, as long as, by a farther use of the forceps, we can extract any more of the polypus. And even when the operation is finished, if the patient is in any degree plethoric, some advantage may ensue from

a farther discharge, by which inflammation may be prevented, which otherwise might produce very troublesome consequences. Profuse hemorrhagies from this operation seldom happens; by no means so frequently as those are apt to imagine who have not often had occasion to practise it. I will not pretend to say that instances may not occur of more blood being lost by it than is proper; but I can safely assert, that it is not a common occurrence. When it is found, however, that the hemorrhagy is proceeding too far, we should immediately employ those means that we know from experience are most effectual in putting a stop to it; but these having already been fully considered in Section III. of this Chapter it is not necessary to enter upon them at present.

As it sometimes happens that part of the roots of polypi are not extracted by the forceps, we are desired by some practitioners to destroy them, by inserting caustic or corrosive applications into the nostrils immediately after the operation. Unless, however, we can evidently observe the spot on which the caustic should be applied, I am clearly of opinion that this practice should not be adopted; otherwise we must work entirely at random, and will more probably do harm than good. But when, by exposing the nostril to a clear light, we can bring the seat of the excrescence into view, we may with propriety touch any parts of it that remain with lunar caustic, properly covered with a canula, in order to protect the contiguous sound parts. An instrument for this purpose is represented in fig. 1. Plate XXXIV. This, however, should not be attempted on the day of the operation, as is commonly advised; for while any discharge of blood continues, a clear view of the parts cannot be obtained: but it may with propriety be done on the following day; and the caustic should be repeated every second or third day, as long as any remains of the excrescence are observed.

When, again, the root of a polypus lies so deep that it cannot be discovered, if we find, either by the introduction of a probe, or by the breathing through the nostril not being free, that the excrescence is not entirely removed by the forceps, although, for the reasons I have mentioned, caustic should not in this situation be employed, it may be highly proper to destroy it by means of a more harmless nature. In this case, the practice I have described, of passing a seton through the nostril into the throat, might sometimes answer, but the frequent application of large bougies succeeds with greater certainty. In one of the following chapters I shall have occasion to remark, that in the removal of obstructions in the urethra, bougies seem to operate chiefly by mechanical pressure; and there is cause to imagine, that upon the same principle they may be employed with advantage for the removal of those parts of polypus excrescences in the nostrils that cannot be taken away with the forceps. Nay more, were we consulted early in the disease, before the excrescences have become large, they might, I think, be successfully employed in preventing their further increase; and if duly continued, they might, in some instances, in this incipient state of the disease, remove them entirely. Practitioners, however, are seldom advised with, till the disease has gone too far to admit of this. I have only had one opportunity of trying it; but in this case, the effects of it were such as to justify our putting it to the test of future experience.

This was the opinion that I published of this remedy several years ago, and since the first editions of this work were printed, I have had many opportunities of putting it to trial. In all it gives great relief, by enabling the patient to breathe more easily through the nose, and in some it has entirely removed the disease. It is not, however, the common bougie that I employ, but a piece of bougie plaster rolled up into a flat form, nearly of the breadth and thickness of the forefinger of

an adult ; and of a length to pass into the pharynx, while half an inch or thereby remains out of the nostril. The plaster should be of a firm consistence ; the bougie perfectly smooth ; and if well covered with oil it may be easily passed, even where the excrescence is so large as to fill a considerable part of the nostril : the patient is soon able to insert it himself, and by doing it every night at bedtime, and withdrawing it in the morning, it gives him little trouble in the application, while it commonly soon affords relief to the state of his breathing.

The person in whom this mode of treatment was first employed, had for several weeks complained of a kind of stuffing, and interruption to breathing in one of his nostrils. On looking into it, I clearly saw and touched with the probe, a small, pale coloured, soft polypus, at a considerable depth. As it did not yet produce much inconvenience, I did not think of advising it to be extracted ; but considering it as a fit case for trying the effects of compression, a roll of bougie plaster was passed into the nostril ; and being gradually increased in size, the passage at last became clear and pervious ; and in the course of seven or eight weeks, the excrescence disappeared almost entirely ; but the patient was at this time obliged to go abroad, and I have not since that period heard of him.

In the latter part of the treatment of this case, a silver tube covered with plaster was employed ; by which the breathing went freely on ; and being of such a length as to pass into the pharynx, it was easily kept inserted, and was prevented from falling out, or from passing back to the throat, by a piece of adhesive plaster, connected with it by means of a strong thread being applied across the upper lip.

In describing the operation of extracting polypi, I have supposed that the forceps in common use are to be employed ; and when the excrescence is small, they answer the purpose as well as any other : but when the polypus is so large, as nearly to fill the nos-

tril, they cannot be either easily or properly applied ; for the two blades of the forceps being both introduced at once, they cannot but with much difficulty be pushed deep into the nostril already much obstructed ; and the more they are pressed forward upon the excrescence, and the nearer the end of it is brought to the axis of the instrument, the more widely the blades of it are necessarily opened at their extremities ; by which the tumor cannot be so equally compressed, nor is there such a chance of extirpating the root of it by means of them, as if they were so constructed as to apply pressure equally through their whole length.

To remedy these inconveniencies, several improvements have been proposed ; but the best that I have met with is one by the very ingenious Dr. Richter of Gottingen. A representation of it is given in Plate XXXV. fig. 3. This instrument may be used in the ordinary way, by introducing both blades at once, when the polypus is small ; but when the tumor is large, it answers better to introduce the blades separately, as is done with midwifery forceps. One of the blades being carried slowly and cautiously forward along the course of the polypus, the other must in like manner be introduced at the opposite side of it, so that they may now be firmly locked together at the joint. The blades are accordingly made to separate easily, and to fix in such a manner, as to admit of their being employed in the way that I have mentioned.

These, and every other variety of forceps employed for this operation, ought to be as thin and slender in that part of them which is inserted into the nose, as the nature of the disease will admit ; for I must again observe, that the straitness of the part in which the instrument must move, is one of the principal difficulties we have to encounter. But when the forceps are made of well tempered steel, they need never be so thick and bulky as they are commonly made.

When, however, polypi have acquired a large size, the obstruction they produce in the nostril is in some instances to such a degree, that no forceps can be inserted : in such circumstances, as a considerable space may be gained by laying the nostril open, it may in some instances be proper to divide the cartilaginous part of it by a longitudinal cut ; and, after extracting the tumor, to reunite the divided parts either by adhesive plasters, or with one or more futures.

In mentioning this, however, I think it right to observe, that it is a measure which ought not in any instance to be hastily adopted ; but I also think, that it should not be universally condemned, as we find it to be by some practitioners. I do not imagine that it would in every case prove successful : but when a polypus has already become so large as entirely to fill the nostril ; when, therefore, no forceps can be inserted for removing it ; when the tumor is still continuing to increase ; and when of course there is much reason to suspect, that it may terminate fatally if it be not extracted ; it will surely be better to give the patient any small chance that may be derived from the practice I have proposed, than to leave him to die in misery, which in all probability he would do were no attempt made for his relief. If, on laying the nostril open, it is found that the tumor can be with safety removed with forceps, a complete recovery may possibly be obtained ; and thus the pain that the patient has suffered, and the trouble of the operator, will be amply rewarded, whilst no material injury will be done, nor any kind of risk incurred, if, on laying the parts open, it is unfortunately found that no part of the tumor can with propriety be taken away.

In the firm fleshy kind of polypi, which in some instances degenerate into cancer, when it is found that the tumor is already in a state of ulceration, and that the contiguous cartilages and bones of the nose are diseased, it would no doubt be imprudent to advise the treatment I have mentioned, for no advantage

would probably accrue from it ; the patient would be made to suffer a great deal of unnecessary pain ; and the operation itself would be brought into disrepute : but in the softer kinds of the disease, which rarely or never become cancerous, and when the more external bones and cartilages of the nose are not affected, we ought without hesitation to adopt it, when the tumor, as is here supposed to be the case, is meant to be removed with the forceps, and when this cannot be done in any other manner.

In the case of a firm fleshy excrescence, which filled the nostril so completely that the forceps could not be introduced for removing it, a method was put in practice by Dr. Richter for reducing the size of it ; which to a certain degree answered the purpose, and afforded considerable relief. A hole or opening was made through the centre of the excrescence by pushing a common trocar through the whole length of it, after being made red hot and covered with a canula. By this means a passage was formed through which the patient breathed easily, and the tumor was much lessened ; but the Doctor was unfortunately prevented from attempting to complete the cure, either by extraction or otherwise, by the patient leaving the place. This case, however, affords an useful practical hint, and points out a mode of treatment, which in tumors of this particular kind, may in some instances be successfully employed.*

I have thus described the method of extracting polypi of the nose with forceps ; but I must again remark, that they may be removed both with more ease and safety with ligatures ; and as this mode of operating is admissible in a great proportion of cases, it seems only to require to be more generally known, to be very universally preferred.

* For a more particular account of this case, and of the forceps mentioned above, vide Augusti Gottlieb Richteri *Observationum Chirurgicarum fasciculum secundum*, Gottingæ, 1776.

SECTION VI.

Of Extirpation of the Tonsils.

THE amygdalæ or tonsils are frequently, even in a natural state, so large as almost to fill up the passage from the mouth to the throat. As long, however, as they remain sound, and are not attacked with inflammation, any inconvenience that they produce is seldom of much importance: but tonsils of this enlarged size are very apt to inflame on the patient being much exposed to cold; and frequent returns of inflammation are often attended with such an addition of bulk, as to produce nearly a total obstruction to the passage of food, drink, and air.

It is this enlarged state of the amygdalæ that in general is termed a schirrous state of the tonsils; but I think it right to observe, that the term schirrous appears here to be very improperly applied; for, excepting the circumstance of a firm tumor, every other characteristic of schirrus is here very commonly wanting. A real schirrus is attended with frequent shooting pains, and it very commonly terminates in cancer: now we know, that pain very seldom occurs in cases of enlarged tonsils, except from inflammation: while in an inflamed state, they are frequently indeed very painful; but as soon as the inflammation subsides, no more pain is experienced, and they remain perfectly easy and indolent till the patient is again exposed to cold. This, however, is never the case with swellings of the real schirrous kind; for whenever they become painful, they uniformly proceed to turn worse: and, again, enlarged tonsils are seldom or never known to terminate in cancer. I never knew an instance of their doing so; and few practitioners, I imagine, have met with it.

Mr. Sharpe, when treating of this subject, recommends a more frequent extirpation of enlarged, or what he terms schirrous tonsils, than what has hitherto commonly prevailed ; and he is induced to do so, from having observed that the disease never returns, as it too frequently does after the extirpation of schirrous tumors in other parts. His words being much in point, I shall transcribe them. “ All other tumors of the schirrous kind, whether of a scrofulous or cancerous nature, are subject to a relapse ; the poison either remaining in the neighbourhood of the extirpated gland, or at least falling on some other gland of the body. In this case, I have never met with one such instance ; and the patient has always been restored to perfect and lasting health.”*

Mr. Sharpe has here communicated a very interesting fact ; the more valuable, by coming from a man of high reputation, and whose practice was very extensive. By many, however, the truth of his assertion has been doubted, from its being universally known that schirrous tumors frequently return in other parts of the body after being extirpated. It would indeed be surprising to find the extirpation of schirrous tonsils prove always successful when the same operation often fails when practised for similar affections in other parts. But the explanation I have given, sets it in a more distinct point of view. These tumors of the amygdalæ, commonly termed schirrous tonsils, are not of the true schirrous nature ; and hence it is, that they never degenerate into cancer, nor return after extirpation ; and this is accordingly a very weighty argument for removing them as soon as they become so large as to impede either deglutition or respiration. Till this, however, takes place to a considerable degree, no practitioner ought to advise this operation ; for, as it is attended with a good deal of pain, it should be avoided as long as the safety of the patient does not require it ;

* Vide Critical Inquiry, &c. by Samuel Sharpe. Fourth Edition, Section VII.

but whenever the tumor becomes so large as to produce much interruption to the passage of food and air, we should not hesitate to advise it.

Different methods have been proposed for removing enlarged tonsils. Some have advised the repeated application of the actual or potential cautery : others recommend excision with the scalpel or crooked scissors : and, lastly, it has been proposed to do the operation with ligatures.

Cautic, however, should here be considered as inapplicable, from the impossibility of using it without injury to the neighbouring parts ; and we are debarred from the use of the knife and scissors by the profuse hemorrhagies that sometimes occur from excision. Necessity, therefore, obliges us to employ the ligature ; and with due attention, almost every tumor may be removed by means of it with which the amygdalæ are attacked.

In the last section I have given a detail of the best method of applying ligatures to polypous excrescences in the throat, and it likewise appears to be the easiest and best method of forming ligatures upon tumors of the amygdalæ. It ought to be done with pliable silver wire, but catgut of a proper strength will likewise answer ; and although the double canula to be passed through the nose might be of a straight form, it will answer better if somewhat crooked, as in fig. 2. Plate XXXI.

The double of a ligature, formed of pliable silver wire or catgut, being inserted into one of the nostrils, must be pushed back till it reaches the throat, when the operator, introducing his fingers at the mouth, must open the ligature ; and having passed it over the tumor, it must now be pressed closely down to the root of it. In this situation, he must continue to preserve it with his fingers ; while an assistant having inserted the two ends of the ligature into the canula, must push it easily into the nostril, till the farther end of it is either seen or felt in the throat ; and the wire

being now pulled so tight as to fix it in the substance of the tumor, the ends of it hanging out at the other end of the canula must be tied in the manner pointed out in the last section, to the wings or handle of the instrument; and the ligature being made tighter from time to time, the swelling will soon fall off.

The more pendulous the tumor is, the more easily will the ligature be fixed. But however broad the base of it may be, it may with little difficulty be done; for the swelling is always prominent: so that when the double of the wire is fairly passed over, it may easily be pushed down to the base with the fingers; and being preserved in this situation till pulled sufficiently tight, it will not afterwards be in danger of moving.

I have advised the ligature to be first carried through the nose before being put over the tumor. It might be inserted by the mouth; but in this manner more inconvenience would ensue from the ligature and canula hanging out at the mouth during the cure. This method, however, may be tried when any difficulty occurs in applying the ligature by passing it through the nose.

For the most part we find both tonsils nearly equally enlarged, and in some cases the removal of one of them forms a sufficient opening for the passage of the food; but when it becomes necessary to extirpate both, it answers better to allow the inflammation and tension induced by the removal of the first, to subside entirely before attempting to remove the other.

This mode of applying ligatures upon these tumors, is in my opinion the best; but it may often be done in a different manner. Let a ligature sufficiently strong be formed of waxed thread, and carried round the tumor either with the fingers or a split probe, such as is represented in Plate XXXIII. fig. 2. A noose is now to be made on it, by which a knot of any degree of tightness may be tied, by fixing one end of the thread at the side of the tumor in the throat, with the instrument, fig. 2. Plate XXXVIII. while the other is firm-

ly drawn with the other hand of the surgeon out of the mouth.

This method was first put in practice by Mr. Cheselden; and since that period by Mr. Sharpe and others. Where the tumor has a broad base, in order to fix the ligature, a needle with an eye near the point, such as is represented in Plate XXXVIII. fig. 3, was likewise proposed by Mr. Cheselden. A double ligature being put into the eye of the needle, the instrument is pushed through the centre of the tumor near to its base, and the threads being disengaged with a pair of forceps, the needle is withdrawn. In this manner two ligatures are to be formed, each of them being made to comprehend one half of the tumor by one of the threads being tied above, and the other below. The instrument, fig. 2, of the same Plate, is likewise necessary here.

Although it is proper to mention this method of fixing ligatures upon tumors of the tonsils with broad bases, it will not probably be often employed. The double canula renders it unnecessary, as we can apply, by means of it, such a degree of force as will at once fix the ligature in the substance of the swelling: even when the operation was done in a manner that did not admit of the ligature being so firmly fixed as may be done with the double canula, Mr. Sharpe was of opinion, that Mr. Cheselden's method of performing the operation was unnecessary. His observation on this point is, "That he had never in one instance found it necessary to employ the double ligature recommended by Mr. Cheselden."*

By whatever method, however, the operation is performed, the tumor will not in every instance fall off by the first ligature; in which case, another must be applied, and continued till a cure be obtained.

* Vide Mr. Sharpe's Treatise on the Operations of Surgery, Chap. xxiii.

SECTION VII.

Of the Extirpation of the Uvula.

THE uvula, by frequent attacks of inflammation, as likewise from other causes, becomes in many instances so relaxed and elongated, as to excite much distress, not only by impeding deglutition, but by irritating the throat so as to induce cough and retching.

Slight degrees of enlargement of this part may in general be removed by the frequent use of astringent gargles, composed of strong infusions of red rose leaves, Peruvian bark, or oak bark, with a proportion of alum or vitriolic acid; and as long as remedies of this kind answer the purpose, no others should be advised. But when these fail, and when the uvula becomes so large as to create much distress, we depend on extirpation alone for a cure.

The uvula may be extirpated either with a ligature or by excision. By the last, the parts affected are quickly removed, and the patient obtains immediate relief; whereas the other is not only slow in its operation, but is applied with difficulty. But by excision, troublesome hemorrhagies sometimes occur, while no risk whatever ensues from ligatures. Some practitioners indeed allege that no danger can ensue from any hemorrhagy that takes place from the removal of the uvula by excision; but although this may frequently happen, yet I know from experience that instances of the contrary sometimes occur, and that large quantities of blood have been lost by this operation. This will most readily happen where the uvula is much enlarged, and where of consequence the vessels with which it is supplied are in an enlarged state. Where the uvula is merely elongated, there will seldom, I imagine, be much risk in removing it by excision. In this state, therefore, of the disease, excision

should be preferred ; but when the parts to be removed are much increased in bulk, it answers better to do it with ligatures.

Different instruments have been invented for cutting off the uvula. The one that has been most frequently used is represented in Plate XXXIX. fig. 1. But neither this, nor any other of a similar form, answers the purpose so well as a curved probe pointed bistoury, such as is delineated in figure 3. of the same Plate. Or the operation may be very easily done with scissars of the common form, or with a curve, such as is represented in Plate XXXVI. fig. 2.

When any of these instruments are employed, the mouth being first secured with a speculum, such as is represented in Plate XLI. fig. 1, the uvula should be laid hold of with small forceps, or with a sharp hook, by which it will be more easily cut off than if left loose in its natural pendulous state. After the operation, if much blood is discharged, it may be restrained by the use of an astringent gargle ; by the application of ardent spirits ; or even by touching the bleeding vessel with lunar caustic. It will seldom happen, however, that any precaution of this kind is necessary ; for a moderate flow of blood will never do harm, and more than this will rarely occur where the parts are not much enlarged. When, again, a ligature is to be employed, the mode of fixing it described in the last section may be adopted : it may be done by the double canula passed through one of the nostrils ; or the canula may be introduced at the mouth ; or it may be done by the method employed by Mr. Cheselden, for applying ligatures upon the tonsils, also described in the last section. After passing the ligature round the tumor, which in general will be easiest done with the fingers, a knot may be tied on it in the manner I have there directed, with the instrument, fig. 2. Plate XXXVIII.

I have likewise thought it right to represent another instrument, hitherto almost the only one employed

for fixing a ligature upon the uvula, Plate XXXI. fig. 3. From the name of the inventor, it has commonly been termed the Ring of Hildanus. The invention is very ingenious; and by means of it a ligature may be firmly applied upon the uvula: but the same intention may be accomplished in a more simple manner, by either of the other methods described above; so that this will probably be laid aside.

SECTION VIII.

Of Scarifying and Fomenting the Throat.

IT frequently happens in inflammation of the amygdalæ and contiguous parts, that scarifications become necessary; in the first place, for lessening the degree of inflammation by inducing a topical discharge of blood; and afterwards for the discharge of matter contained in abscesses, when suppuration has not been prevented by the means usually employed for this purpose.

In Plate XL. figs. 1. and 3. I have delineated different forms of instruments for this purpose: the wings with which figure 1. is furnished, are meant to compress the tongue, while the scarificator is employed in the back part of the mouth. With either of these, scarifications may be made, or abscesses opened, in any part of the mouth or throat with entire safety.

In the treatment of inflammatory affections of these parts, we often find it necessary to recommend fomentations; a remedy which proves also useful in catarrhal affections of the trachea and lungs. Various methods are proposed for conveying steams to these parts; but the best that has yet appeared, and it is likewise the neatest and most simple in its construc-

tion, is the instrument delineated in Plate XL. fig. 2. the invention of Mr. Mudge of Plymouth. By means of it, the throat, trachea, and lungs, may be very effectually fomented by drawing warm steams into them, and without any difficulty or inconvenience to the patient, who may lie in bed during the whole operation. This instrument I consider as so highly useful in the treatment of every case of catarrh, that I think every family should have it. .

CHAPTER XIII.

OF DISEASES OF THE LIPS.

SECTION I.

Of the Hare Lip.

NATURAL deficiencies are not so frequent in any part of the body as in the lips. Children are often born with fissures in one of the lips, particularly in the upper lip. In some instances this is attended with a want or real deficiency of parts ; in others we only meet with a simple fissure or division ; whilst in some again, there is a double fissure with an intermediate portion of the lip between them. Every degree of this affection is termed a hare lip, from a resemblance which it is supposed to bear to the lip of a hare.

For the most part this fissure or opening is confined to the lip itself : but it often extends back along the whole course of the palate, through the velum pendulum and uvula into the throat ; and in some instances the bones of the palate are either altogether or in part wanting, while in others they are only divided or separated from each other.

Every degree of the hare lip gives much deformity, and it sometimes prevents a child from sucking : it is always productive of some degree of impediment of speech ; and when the division extends along the bones of the palate, the patient is much incommoded both in chewing and swallowing, by the food passing readily up to the nose. When in the under lip, which is not often however the case, it commonly prevents the saliva from being retained.

These are all very urgent reasons for an early removal of the hare lip being attempted : where it interrupts, indeed, the suckling of the child, the operation must either be done immediately, or the child must be fed with a spoon ; but by practitioners in general, we are desired at all events to delay the operation to the third, fourth, or fifth year ; lest the crying of the child should render the means employed for obtaining a cure altogether abortive.

This reason, however, does not appear to be of importance ; for till the child arrives at his twelfth or fourteenth year, when we may suppose him to be possessed of sufficient fortitude for submitting easily to the operation, the same objection holds equally strong : nay, a child of six or eight years of age is in every respect more difficult to manage than one of six, eight or twelve months. I am therefore clearly of opinion, that in a healthy child the operation should never be long delayed ; for the more early it is performed, the sooner will all the inconveniencies produced by the disease be removed ; and now, after various trials, I find that it may be done even in very early periods of infancy, perhaps in the third or fourth month, with the same prospect of success as in any period of life. I have done it in the third month with very complete success, but the twelfth or thirteenth answers better.

Practitioners all agree in regard to the intention of this operation, which is to cut off the sides of the fissure so as to reduce the whole of it to the state of a recent wound, and then to draw them together, and retain them in contact till they unite. But although the principles on which this practice rests are universally admitted, authors are of very opposite opinions in regard to the best method of carrying it into effect. By some we are advised to employ the interrupted suture for retaining the sides of the fissure : others prefer the twisted suture : whilst by many, sutures of every kind are said to be improper ; and that a cure may be always obtained with adhesive plasters, or banda-

ges; by which means a great deal of pain would no doubt be avoided, which futures are always sure to excite.

This is a point of much importance, and therefore merits particular discussion; more especially as it has been warmly contested even by surgeons of reputation.

In the treatment of every disease, our principal object is to obtain an effectual cure; but every practitioner will allow, that the easiest mode of effecting this should be preferred. On this principle, much pains have been taken to shew, that futures are seldom necessary in wounds of any kind, especially in the cure of the hare lip; and in support of this opinion, various cases are recited of cures being performed with bandages alone: nay, some have gone so far as to assert, that in every instance of hare lip a cure may be obtained with more certainty with a bandage than by futures; for they allege, that the irritation produced by futures serves in a great measure to counteract the very purpose for which they are employed. After the edges of the fissures are cut off or rendered raw, the contraction of the adjoining muscles is the only difficulty that we have to encounter; and this, we are told, instead of being removed by futures, is always increased; while the same intention, it is said, may be accomplished with no inconvenience whatever, by a bandage applied in such a manner as to keep the edges of the fore in close contact, which it does by supporting the contiguous parts so as to prevent the reaction of the muscles with which they are connected.

That a hare lip may be completely cured with the uniting bandage, or even with adhesive plasters alone, there is no reason to doubt; and being attended with less pain than the method of cure by futures, it ought in every case to be preferred, if with equal certainty it could be relied on: but although with much pain and attention, we might in some instances be able to

accomplish a cure, with plasters and bandages; yet, from the nature of the remedy, there is cause to imagine that it would frequently fail; for in the cure of the hare lip, if every point of the parts meant to be united be not kept in contact till complete adhesions take place, our intention is always frustrated, and nothing afterwards answers the purpose, but a repetition of the operation in all its parts. The edges of the fore must be again rendered raw, and the patient must submit, either to another application of the bandage, or to the use of futures; which, if employed at first, might have saved much trouble both to himself and the operator: for it is proper to observe, that in cases where the operation is applicable, the method of cure by futures, when rightly conducted, never fails; at least I have never known an instance of its doing so. It sometimes happens, indeed, that the deficiency of parts is so great, as to render it impossible by any means to keep them in contact; and if futures are employed in cases of this kind, they will no doubt fail. This, however, is not the fault of the remedy, but of the operator, in using it in an incurable variety of the disease.

As I have had often occasion to put this operation in practice, and being at first prepossessed in favour of the method of cure by bandages and plasters, I gave them both a fair trial; and the result was exactly what I have mentioned. I found, that by a proper application of bandages and plasters, a complete cure might in some instances be obtained, but that the greatest care and attention could not ensure success; and finding that disappointments never occur from the use of futures, I have now laid every other method aside; and hitherto I have had no cause to regret my having done so. I shall therefore proceed to describe the operation as it ought to be performed with futures; and as none of the methods by bandages or futures will ever probably be received into general use, it would be considered as superfluous to give an

account of them : and besides, our doing so here is unnecessary, as the subject has already been fully treated of by various authors of reputation, particularly by Monsieur Louis, of Paris, who has given a paper in the 4th Volume of the Memoirs of the Royal Academy of Surgery, that contains every argument that has been suggested in favour of this method of curing the hare lip with bandages.

In proceeding to the operation, the patient, if an adult, should be seated opposite to the light, with his head properly supported by an assistant ; but if a child, he will be more firmly secured if laid upon a table, and kept in a proper posture by an assistant on each side.

The upper lip should now be completely separated from the gums beneath, by dividing the frenum that conjoins them. This admits of the lip being more equally stretched ; and when one of the fore-teeth is found opposite to and projects into the fissure, as sometimes happens, it ought to be taken out, otherwise it will irritate and stretch the parts if allowed to remain. In some instances, too, especially when the fissure runs through the bones of the palate, a small portion or corner of bone is found to project from one or both of the angles. This should likewise be removed ; and it may be easily done with pliers or forceps, which should be both firm and sharp, as is represented Plate XLIII. fig. 2.

These preparatory steps being adjusted, the surgeon, standing on one side of the patient, must take one side of the lip between the thumb and forefinger of his left hand ; and desiring an assistant to do the same with the opposite side, and to stretch it somewhat tightly, he should with a scalpel make an incision from the under border of the lip up to the superior part of it ; in which he must take care to include, not only all the parts immediately concerned in the fissure, but even a small portion of the contiguous sound skin and parts beneath : and this being done on one side, a sim-

ilar incision must be made on the opposite side; which ought to be of the same length with the other, terminating in the same point in the upper part of the lip. By this means, if the operation is rightly done, a piece, including the fissure completely, will be cut out, of the form of the letter V inverted; and the deficiency will in every part of it have the appearance of a recent wound.

With a view to prevent inflammation, the divided arteries should be allowed to discharge freely; especially if the patient is plethoric; and this being done, the surgeon should proceed to unite the sides of the fissure. In this he will be much assisted by desiring the cheeks to be pushed forward so as to bring the edges of the wound nearly into contact, although not altogether so close as to prevent him from seeing freely from one side of it to the other; the assistant behind being desired to support the parts in this situation during the remaining steps of the operation.

The surgeon is now to see that the two sides of the cut correspond exactly with each other; and this being done, the pins intended to support them must be introduced in the manner I have mentioned in describing the twisted suture, Chap. V. Sect. V. The first pin should be near to the under edge of the lip: if possible, indeed, it should be placed entirely within the red part of the lip, leaving no more space beneath than is merely necessary to support it. In adults, another pin should be inserted in the centre of the cut, and a third within a very little of the superior angle. By some we are advised to use a greater number of pins; but even in adults three are always sufficient, and in infants two will very commonly answer. In passing them, they should be made to enter nearly half an inch from the edge of the fore; and being carried nearly through the whole substance of the lip, which will be seen by retaining the wound open in the manner I have advised, they must be again passed outward, in a

similar direction, and to an equal distance on the opposite side of the fissure.

The assistant should now push forward the cheeks, and having brought the edges of the sore close together, a firm waxed ligature should be applied over the pins in the manner I have formerly mentioned for the twisted future, as will perhaps be better understood by fig. 3. Plate XLIV. The ligature should first be applied to the under pin, and being made to pass two or three times round it, so as to describe the figure of 8, it should then be carried to the contiguous pin; and being in a similar manner carried round this pin, the operation is finished by carrying it to the other; care being taken in the whole course of applying it, to draw it of such a tightness as may retain the parts in contact; but not so strait as to irritate or inflame them, as is too frequently done.

By some we are desired to use a separate thread for every pin, in order, as they say, to admit of one pin being removed, if it should become necessary, without disturbing the others. This, however, I have never found to be the case; so that the precaution is unnecessary, while it deprives us of the advantage of passing the ligature diagonally from one pin to another, by which we have it in our power more effectually to prevent the sides of the fissure between the pins from rising into unequal heights than otherwise could be done.

A piece of lint covered with mucilage to retain it, should now be put over the cut, with a view to protect it more effectually from the air; and it should likewise be made to cover the ends of the pins, to prevent them from being entangled with the bedclothes, or otherwise; and this is all the dressing or bandage that in general we ought to apply. We are desired indeed by many, after the pins are all secured with ligatures, to apply the uniting bandage, in order to support the muscles of the cheek, so as to prevent the pins from cutting or irritating the parts through which they pass,

which they are apt to do, when the deficiency of parts is considerable.

In the course of my experience, however, no benefit has ensued from this, while in some instances it does harm, for a bandage cannot be applied with such tightness as to give support to the muscles of the cheek without exciting pain in the parts newly divided; and it also proves hurtful, as I have elsewhere observed, by pressing upon the ends of the pins over which it must pass; for even although a slit is made in that part of the bandage which corresponds to the lip, as some have advised, pressure upon the pins can scarcely be avoided: and besides, although a bandage may be applied sufficiently tight at first, the motion of the jaw commonly loosens it soon, so as to prevent it from having any farther effect. When, however, the deficiency of parts is great, and the edges of the sore are with difficulty brought together, some advantage may be derived from a proper use of adhesive plasters. An oblong piece of leather, spread either with common glue, or with strong mucilage, such as is employed in making court plaster, being applied over each cheek, and of a size sufficient for reaching from the angle of each jaw, to within an inch or thereby of the pins, and each piece of leather having three firm ligatures fixed to that end of it next the pins, one at each corner and another in the middle, the cheeks should now be supported by an assistant, when the ligatures should be tied so as to retain the parts in this situation; and if care is taken to make the ligatures pass between the pins, and not immediately over them, little harm will be done them. It rarely happens, however, that this kind of assistance is needed; for I have, in almost every instance, found that the pins alone answer the purpose.

It is scarcely necessary to observe, that while the pins are in the lip, the patient should be fed upon spoon meat, and be prevented from laughing, crying, and stretching his mouth in any manner of way.

The pins having remained in the lip for five or six days at farthest, they should then be taken out ; for I have found by experience, that the parts are by that time united ; and by remaining longer, they are apt to leave marks which do not so readily disappear as when they are removed sooner. I have reason indeed to think, that three days would frequently prove sufficient ; but as I know from experience that the pins may, without detriment, be allowed to remain for five or six, I think it better not to remove them sooner.

In order to illustrate what I have said, some figures are delineated in Plate XLIV. representing the appearance of a hare lip before the operation ; the parts which ought to be removed ; the application of the pins ; and the appearance which the parts should have when the operation is finished. But for a more particular account of these, I must refer to the explanation of the Plate.

What I have hitherto said relates to the disease in its most ordinary form. In the case of a double hare lip, the operation requires to be performed twice in all its parts ; first in one fissure, and then in the other ; although by some we are advised to do them both at the same time : but this should never be attempted ; for by doing so, we incur the risk of losing all the advantages to be derived from the intermediate sound parts, and of which I once met with a very distressful instance. The sound part of the lip lying between the two fissures, was by no means inconsiderable, but being much stretched with a great number of pins passed through it, it began to inflame immediately after the operation ; and the inflammation and pain increasing, the whole pins were obliged to be removed, and the patient would not afterwards submit to any farther trial. We ought, therefore, first to complete the cure of one fissure ; and this being done, we may in the space of a few weeks venture with much safety on the other.

In describing this operation, I have desired, that although the fissure may not extend the whole breadth of the lip, yet that the cut should pass up to the upper part of it; and any person accustomed to this operation, will know that the parts may be united much more neatly in this manner, than when the lip is only cut through part of its breadth. By one method of treatment, the parts, when drawn together, are smooth and equal; but by the other, they are apt to be uneven, and much puckered.

I have also desired that the surgeon should take particular care to make the two sides of the cut exactly of an equal length; a point of much importance in this operation, and requiring more attention than it commonly meets with: for it is obvious, if one side of the wound is longer than the other, that the cicatrix will not be smooth and even, as it ought to be: by inserting the first pin at the edge of the lip, this part of it will indeed be properly united, but the rest of it must be uneven. The most effectual preventative of this, is to mark with small dots of ink, not only the length of the cut on each side, but the direction that it ought to take, by which every chance of going wrong is guarded against.

It is of much importance to have the lip equally and tightly stretched in making the incision, otherwise the edges of the sore will be ragged and uneven: this, with proper attention, may be always done; but with a view to guard against it as much as possible, curved forceps may be employed for laying hold of the lip. Different forms of these are delineated in Plate XLII. fig. 2. and 3. They should be made so as to compress the lip equally; and being applied in the direction intended for the incision, the scalpel is carried along the side of them, by which the cut may be made very exact and even. Other forms of this instrument have been proposed; but those that I have delineated are more simple, and answer the purpose better than any that I have met with.

By some we are desired not to employ any instrument of this kind, under an apprehension of its irritating and bruising the lip. This suspicion, however, can have occurred only to those by whom it has never been used ; for when the blades are smooth and equal, a degree of compression may be made with it perfectly sufficient for fixing the lip without creating pain, which I can assert from much experience of its utility.

Instead of making the incision in this manner, some desire it to be done by fitting a piece of pasteboard, lead, or tin, to the gums beneath ; and the lip being placed on it, it is divided by cutting down on it with a scalpel to the supporting substance : the operation may no doubt be done in this manner, but the cut is more easily made in the manner I have advised.

Till of late, the incision in this operation was commonly made with scissars ; and although they are now very generally laid aside on the supposition of their bruising the lip, yet I know that the operation may be very properly done with them. Scissars should not be employed to cut a part of much thickness, but the lip is seldom so thick as to render it improper to use them in this operation. They have of late been used in this place by different practitioners ; and as the point can be determined by experience only, I have likewise employed them. In order to ascertain which of the two modes of operating, that with the scalpel or scissars, should be preferred, I have in different cases made the incision on one side with a scalpel, and on the other with scissars. The patients commonly say that the scissars give least pain, probably from their making the cut in less time than can be done with the knife ; and, during the cure, that side of the lip on which the cut is made with scissars, neither swells nor inflames more than the other. I do not from this, however, mean to say, that scissars are preferable to the scalpel ; I mention it only to shew that the common idea entertained of the effect of scissars is ill founded, and that the operation may be equally well

done with both instruments. Scissars for this purpose should be very strong, and particularly firm at the joint. They should also be highly polished. The size and form of them represented in Plate XLIII. fig. 1. has been frequently used, and is found to answer.

When describing the twisted suture in Chapter VI. I gave the preference to gold pins; and I am clearly of opinion that they are the best. When of a proper form, such as are represented in Plate IV. figs. 2. 3. and 4. they pierce the lip with much ease, without any assistance from a *porte-aiguille*: but those who think that a sharper and firmer point than can be given to gold will answer better, may have steel points added, as is represented in figures 6. 7. and 8. of the same Plate; and the steel points being moveable, they may be removed after the pins are passed, by which every risk is avoided of wounding the contiguous parts. By some practitioners, flexible needles are employed for this operation; but they do not answer so well as those that are firm, and give sufficient resistance to the ligatures.

In passing the needles, I have said that they should go nearly through to the opposite side of the lip: this merits particular attention, otherwise a fissure is apt to remain in the inner part of the lip, from which a good deal of trouble may be experienced. And besides, although the discharge of blood that succeeds to this operation is always stopt immediately on the parts being drawn together by the ligatures if the pins have been properly introduced, yet when not passed to a sufficient depth, the blood will continue to get out behind, and may afterwards be productive of much distress. I have seen an instance of this, where a very troublesome oozing of blood continued for several days after the operation; and an instance is recorded even of death having ensued from it. In order to prevent the lip from being stretched by the patient in spitting, it is the usual practice to desire him to swallow his saliva with the blood that may be discharged from the

fore. In this case the patient complied implicitly with the directions given him ; and he having died from the cause I have mentioned, namely, a great loss of blood, his stomach and bowels were found filled with blood that he had swallowed.*

I have thus described all the steps of the operation for the hare lip ; and it is proper to observe, that they are equally applicable in the treatment of a fissure in the lip by whatever cause it may be formed ; only, in a recent cut, as the edges of it are already raw, all that the surgeon has to do is to insert the pins and apply the ligatures. In wounds where suppuration has already commenced, there is usually some degree of inflammation upon their edges. While this continues, it would be improper to draw them together by ligatures ; but as soon as the inflammation subsides, we may with sufficient propriety insert the pins and finish the operation in the manner I have advised. We are told indeed by many, that this practice will succeed only in recent wounds, and that it should not be recommended where matter is already formed : I have often, however, acted otherwise, and where the edges of a sore have not become callous, they have never failed to unite with equal ease when covered with pus, as when perfectly recent, and covered with blood.

In cases of hare lip accompanied with fissure in the bones of the palate, after uniting the soft parts in the manner I have pointed out, some advantage may be derived from a thin plate of gold or silver exactly fitted to the arch of the palate, being fixed by a piece of sponge stitched to the convex side of it, and inserted into the fissure. If the sponge is properly fitted and inserted dry, the moisture which it imbibes from the contiguous parts will for the most part make it remain sufficiently firm, by which both speech and deglutition will be rendered more easy. In some cases, however, the form of the fissure is such as to pre-

* Vide Mémoires de l'Académie Royale de Chirurgie, Tom. iv. p. 427.

vent the sponge from having any effect. This always happens when the opening is widest outwardly. For such cases other means have been proposed, especially thin plates with gold springs, made so as to fix upon the contiguous parts; but no invention of this kind has yet been found to succeed.

SECTION II.

Of the Extirpation of Cancerous Lips.

THE under lip is more frequently attacked with cancer than any other part of the body; and as we know of no internal remedy by which the disease can be cured, the only means we employ for it is the removal of the diseased parts. When treating of cancerous ulcers, in the fifth Chapter of this work, I endeavoured to shew, that little dependence can be placed on arsenic or any other of the caustic applications, that have been so much recommended for this purpose; and that we are to trust to the scalpel alone for relief.

When a cancerous fore has spread over any considerable part of the lip, and especially when the lip is altogether diseased, all that a surgeon can do is to remove the diseased parts; to secure the divided arteries with ligatures, when this is found necessary; and to dress the fore as a recent wound. In this manner a cancer may be effectually taken away; but it gives a very disagreeable appearance, from the under teeth and gums being left uncovered; while the patient can neither retain his saliva, nor swallow liquids easily. There is here, however, no alternative; for where the whole lip is taken away, these inconveniences must necessarily ensue, as there is no possibility of drawing the divided parts together.

But when the disease has not attacked any considerable part of the lip, we may always have it in our power to draw the edges of the cut together, so as to make them unite with the twisted future in the manner described in the last section; by which we not only prevent deformity, but the patient is equally capable as before the operation, of swallowing liquids and retaining his saliva: and besides, this method of treatment, as I have elsewhere remarked, by leaving a small extent of cicatrix, seems to have some effect in preventing a return of the disease; at least this has been evidently the case with those that have fallen under my observation. Where the operation has been performed in the usual way, without drawing the divided parts together and uniting them with ligatures, the disease has in several instances returned: but, excepting in a very few unfavourable cases, it has never returned where the hare lip method of treatment has been employed. Nay more, this will sometimes succeed where the other has failed. A man appeared at our Infirmary here, with a cancer on the under lip. It had been twice removed by extirpation in the usual way; but the disease returned after each operation almost as soon as the sore was healed: the lip being sufficiently full, the hare lip method of treatment was next put in practice; the cure was accomplished; and I had an opportunity of knowing, eight years after the operation, that the man remained in good health, without any return of his disease. Nor should we be deterred from doing the operation in this manner, by the disease being extensive, if we find that the parts that have been divided can be drawn together and retained by the twisted future: and this, I may remark, may be always done where the disease does not render it necessary to remove almost the whole lip. The parts, forming the lip, stretch so considerably, that in general this method of treatment may be advised, although only a third part of the lip may remain.

With respect to the method of doing the operation, I must refer to the last section. In addition to which, I have to observe, that all the cancerous parts ought in the first place to be removed, taking care to form the cut in such a manner as will most readily admit of the divided parts being easily and neatly drawn together. When the disease is seated in the lip only, the parts will have nearly the same appearance after this operation, as after that for the hare lip. But when the cancer extends to the cheek, as is sometimes the case, a longitudinal division of the lip will not only be needed, but also a transverse cut into the cheek; both to be united by pins and ligatures: an operation which, in different instances, I have put in practice with very complete success.

CHAPTER XIV.

OF THE DISEASES OF THE MOUTH.

SECTION I.

Anatomical Remarks.

BEFORE proceeding to consider the diseases that are the object of the present chapter, it may be proper to premise a short anatomical description of the teeth, gums, and jaws, the parts in which these diseases are chiefly seated.

On examining a tooth, we find it divided into three parts; that part of it which lies above the gums, termed the body or corona of the tooth; the roots or fangs, which the gums, in a state of health, cover entirely; and a kind of depression between the body and fangs, just where the gums commonly terminate, which we term the neck of the tooth.

The root, as well as the interior part of the corona, is composed of osseous matter; but it appears to differ from bone by our not being able to throw injections into it: for although we are told that this may be done, there is much reason to imagine that the opinion is ill founded, from the best anatomists having failed in it.*

This osseous part of the teeth being of a soft texture, would soon suffer and wear away by mastication: but nature has amply provided against this inconvenience; for we find all that part of them lying above the

* Vide the Natural History of the Human Teeth, by John Hunter, 2d^d edition, p. 36, &c.

gums, covered with a firm, hard substance, termed the enamel. This part of a tooth, besides being much harder than bone, differs from bone in our not being able to pass the most subtil injection into it; nor can it be tinged by feeding an animal upon madder, or any other colouring substance, as is the case with every bone in the body. The enamel is thickest on the upper surface of the teeth, especially in the grinders, where it is most needed; and it becomes gradually thinner as it approaches the neck, where it terminates. At this part we first find the periosteum, which, besides covering all the roots of the teeth, is intimately connected with them, as well as with the surrounding sockets.

In the interior part of every tooth we discover a hollow, or cavity, corresponding to the size and figure of the tooth itself. It commences by a small opening in the extremity of the root or fang, at which the blood vessels and nerves of the tooth enter; and this canal becoming wider as it proceeds forwards, terminates at last in the body of the tooth, where the cavity is filled with a pulpy kind of substance, probably formed by an expansion of the blood vessels and nerves that belong to it. A tooth with one root or fang has commonly only one hole or opening; but some teeth have several fangs, and every fang not only has a canal passing through it, but is supplied with distinct blood vessels, and probably with separate branches of nerves, although these have never been clearly traced into them.

The teeth are fixed in what is termed the alveolar process of each jaw. This consists of a broad thick edge, with which the jaws are furnished, divided into separate cells or openings for the fangs of the teeth; and the roots of the posterior teeth being larger and more expanded than the others, we find accordingly that this part of the jaw is thicker and broader than the forepart of it. In the upper jaw, this difference with respect to thickness, is increased by the antrum

highmorianum, a large cavity in each maxillary bone, immediately above the large molares or grinders of each side. This sinus has no communication with the mouth, but it opens into the nostril between the two ossa spongiosa, by a canal which in the skeleton is large enough to admit a common quill. The alveolar process of the upper jaw is divided from this cavity by a thin plate of bone, in which the roots of the posterior molares commonly terminate; but in some subjects they pass through this plate into the antrum itself.

The lower jaw is in infancy composed of two bones, united at the chin by what is termed the symphysis of the jaw. These bones, however, are soon joined so firmly together, that they have the appearance of one continued and connected piece. Besides the alveolar process, the under jaw is on each side furnished with other two processes, with which it is necessary for practitioners to be acquainted. The anterior, which seems to be chiefly intended for the insertion of the temporal muscle, is termed the coronoid process. It arises in the form of a ridge from the outside of the jaw opposite to the two posterior molares; and proceeding backward and upward, it terminates in a thin sharp point: and the posterior, or condyloid process, which is shorter, thicker, and stronger than the other, terminates in an oblong head or condyle, by which the articulation is formed between this bone and the head.

The coronoid process gives a degree of strength and thickness to the external plate of the alveolar process in this part of the jaw, that does not take place in any other part of it. This renders it improper to extract the two last molares by turning them outwards. They should always be pulled towards the inside of the mouth. Through all the rest of the jaw, the sockets or alveolar processes are weakest on the outside, although the difference is inconsiderable; and they are in both sides weaker in the upper than in the under jaw.

The full number of teeth in an adult is thirty-two ; and being of different forms, and intended for different purposes, they are accordingly distinguished by particular names. The four anterior teeth in each jaw are named incisores ; the next to these on each side are the canine ; and the five posterior teeth on each side are termed the molares or grinders ; the two first the small molares, and the other three the large molares or grinders.

In childhood there are only twenty or twenty-four teeth, which continue till the sixth or seventh year, when they begin to drop, and are succeeded by others, termed the adult or permanent teeth. The first set, or milk teeth as they are commonly called, as well as some of the others, are formed in the jaw before birth ; but they do not in general appear above the gums till the child is several months old. In some instances, about the fourth or fifth month, but most frequently about the eighth or ninth, two of the incisores appear in the lower jaw. These are commonly succeeded by two in the upper jaw, and the other four foreteeth appear afterwards, at uncertain periods, between this and the tenth or twelfth month. About the sixteenth or seventeenth month, four of the large molares appear ; for in childhood there are no small molares : one of these push out on each side, leaving a space between them and the incisores for the canine teeth ; which being formed farther up in the jaw, seldom appear before the twentieth month : but about this period, or between this and the end of the second year, they and other four molares commonly make their appearance.

These are the periods at which the infantine set of teeth usually appear ; but much variety is met with in this. I have known the canine teeth appear before any of the molares. In one instance, they came forward before two of the incisores. In some cases the incisores have been observed in the second and third months, nay, even at birth ; whilst in others, I have

known the fourteenth or fifteenth month pass over before any have appeared.

These teeth continue firm till the fifth or sixth year. About this period they begin to loosen; and between the seventh and twelfth year they are commonly all shed and succeeded by others. By this period, too, the jaws are somewhat lengthened, so as to admit of other four molares. Between the twelfth and sixteenth years four others appear; and about the eighteenth, nineteenth, or the twentieth year, the four last of the molares appear, usually named the *dentes sapientiæ*.

The two sets of teeth have very different appearances, inasmuch that we may in general know, from the appearance of a tooth, whether it belongs to the infantine or permanent set; and as this is often a point of importance, practitioners ought all to be able to judge of it; particularly in the treatment of those diseases of the teeth that occur about the time of shedding the first set; for it frequently happens that we would have no hesitation in pulling a tooth, were we certain that it belonged to the first set; while we would rather allow it to remain, if it appeared to be one of those that should continue during life. It has happened, indeed, in a few instances, that a third set of teeth have appeared; but this is such a rare occurrence, that it can only be considered as a very unusual deviation of nature.

The sockets of the teeth, and a small portion of the teeth themselves, are covered with a red, firm, fleshy kind of substance, termed the gums. This substance seems to be almost entirely vascular; for the slightest wound or scratch in it is always attended with a discharge of blood. The alveolar process of each jaw is entirely covered with it; so that there is a small portion of gums between every two teeth. In some diseases, particularly in the scurvy, a partial separation of the gums from the teeth often takes place; but in a healthy state they adhere so firmly to the necks of

the teeth as to have some effect in fixing them in their sockets.

We shall now proceed to treat of the diseases of these parts, and of the operations performed upon them.

SECTION II.

Of Dentition.

DURING the approach of the first set of teeth, and in some instances of that of the second, much distress is apt to arise from the irritation which they excite in the gums. For this reason I have thought it right, before proceeding to the diseases of the mouth, to offer a few general observations on dentition.

In dentition, the gums inflame and become full about the part where the teeth are afterwards to appear. The child is constantly rubbing them with his fingers. The saliva is for the most part increased in quantity; but in a few instances it is otherwise, and the mouth becomes perfectly dry. The bowels are commonly very irregular, so that we seldom meet with a medium between obstinate costiveness and severe degrees of purging: the heat of the body is increased, and quickness of pulse takes place, along with other symptoms of fever. These are the most frequent symptoms of dentition; but it often happens that subfultus tendinum, and even convulsions supervene.

As these symptoms all arise from irritation, those means are chiefly to be trusted that prove most effectual in counteracting this. Hence we derive much advantage from opiates, blisters, and especially from warm bathing. But when these fail, which they often do, we have it frequently in our power to remove

every symptom, by making an incision through the gums directly upon the approaching tooth or teeth ; an operation usually termed scarification of the gums.

A common prejudice prevails against this operation, from an idea of its doing harm in the event of a cicatrix being left upon the gums ; which sometimes happens when the tooth is not just at hand ; for it is supposed that the cicatrix will afterwards be worse to penetrate than if the gum had not been touched. For this reason, the operation is seldom or never advised till the tooth is observed to have elevated the gum : but in this we are wrong ; for when delayed so long, almost all the advantages that might be derived from it are lost. I have commonly observed, that the very worst symptoms of dentition take place, before the teeth have come this length ; and that they usually abate on the teeth approaching towards the surface of the gums, probably from their being rendered more insensible by the long continued pressure of the teeth beneath.

Whenever there is cause, therefore, from the symptoms, to suspect that they are owing to this cause, we should without hesitation make a free incision through that part of the gums where the tooth appears to approach ; and if this incision should afterwards heal, and if the symptoms should again supervene, no risk could occur from the operation being repeated. I have frequently found it necessary to cut two or three times upon the same tooth ; but with a view to prevent the necessity of this, I commonly make a crucial incision down to the depth of the tooth, and I have never found it to do harm. We need never be afraid of hemorrhagy. Indeed the cut seldom bleeds above a few drops, and it commonly heals easily.

The operation may be done with a common lancet ; or with a bistoury or scalpel ; the instruments usually employed for it : but it cannot be neatly done with any of these ; and besides, we are in danger, either with a lancet or scalpel, of hurting the conti-

guous parts. The instrument represented in Plate XXXVI. fig. 4. is not liable to any of these objections; and being of a small size, it may be entirely concealed in the palm of the hand. The child being secured by the nurse, the surgeon with the fingers of one hand should open the mouth; and conducting the edge of the instrument with the forefinger of the other, the incisions should be finished before it is withdrawn, care being taken to make a crucial cut over every tooth that appears to be approaching. The incision, as I have already advised, should always be carried to the depth of the tooth, so as to lay it entirely bare; and when this is freely done, the effects that result from it are often remarkable. I have seen instances of children being instantly relieved by it, who previously appeared to be in the most imminent danger.

It sometimes happens, too, as I have already observed, that disagreeable symptoms take place from the approach of the second set of teeth. I have known pain produced over the whole jaw, attended with swelling and inflammation of the gums, cheeks, and contiguous parts, from a single tooth not getting freely out. This happens most frequently with the *dentes sapientiae*; in some instances, from the irritation that they produce upon the gums, which in the back part of the jaws are very thick; but in others from their not being room in the jaw to admit them. In the first case, we have it commonly in our power to remove all the symptoms, by making a free incision directly upon the tooth; but in the other this does not always prove sufficient, and nothing will frequently answer but extraction of the tooth. When the symptoms are found to proceed from this cause, we should not hesitate in removing the tooth: for it seldom happens that any advantage is gained from delaying it, while the inflammation induced upon the gums often spreads to the throat and contiguous parts; and is thus productive of much distress, which might

be easily prevented. When the throat inflames and swells, no other remedy will answer, while the most violent degree of inflammation will be removed in the course of a short time, by the removal of the tooth. This I have known where the symptoms had obstinately resisted every other means for a great length of time.

SECTION III.

Of the Derangement of the Teeth.

THE second set of teeth frequently appear in a very irregular manner: some of them will be very properly placed, while some are farther out, and others farther in, than they ought to be. When the derangement is not very remarkable, it seldom meets with much attention; but it often happens, that the deformity is so considerable, that artists are applied to for removing it. It happens most frequently with the incisores and canine teeth, seldom with any of the molares.

Derangements of the teeth may take place from different causes: from a deficiency of space in the jaw, by which they cannot be all admitted in the same line; from a natural mal-conformation; or from some of the first set remaining firm after the second set have appeared.

We often find, that teeth that are out of the line will fall into it without any force being applied to them, on space being given them by one or more of those in the line being pulled. When it appears, therefore, that the derangement proceeds from any of the first set not having dropped, they ought to be removed; for the longer this is delayed, there will be the less chance of the irregular teeth falling into their situation: but when it even proceeds from those of

the second set being too large for the space they are to fill, we should not hesitate in removing some of them, for no other method will answer. When the teeth which occupy the natural circle of the jaw are regular, and have a good appearance, the tooth or teeth that are out of the circle ought to be pulled; but when either of the contiguous teeth do not fill the place so properly as these would do, or when they are rough, or otherwise of a disagreeable appearance, it is sometimes advisable to remove one of these that are in the circle, while at the same time we endeavour to bring the others into it. If this is done before the teeth have been long fixed, and if they are not far distant, they will sometimes in a gradual manner, as I have already observed, fall into the vacancy without any assistance; but when this does not happen soon by an effort of nature alone, we may frequently employ means for promoting it. No attempt, however, of this kind can be made till the body of the deranged tooth has passed freely out from the gums, as till then we cannot with ease lay hold of it.

The usual method of moving teeth that are out of the range, is to apply a ligature round them, and pulling it tighter from time to time, to fix each end of it firmly to the contiguous teeth: or a plate of gold or silver is fitted to the contiguous teeth, and made to surround the deranged teeth in such a manner, that when firmly pressed down by the opposite jaw, it acts with considerable force in bringing the teeth nearer together. This last method, however, proves troublesome to the patient; and the other, while it in some degree moves the deranged teeth towards the circle, serves nearly in the same degree to draw the others out of it: but we may in a different manner apply a ligature for this purpose with safety, and it is the best that I have seen for the purpose. Let a thin plate of gold of a length sufficient to pass over four of the contiguous teeth, be exactly fitted to the outside of the two teeth on each side of the vacancy into which the deranged tooth

is to be moved. The plate should be perforated with several small holes : on being applied to the teeth, and fixed to them with a bit of waxed thread, let a piece of flexible wire be passed through two of the holes ; and the doubling of the ligature being carried over the tooth to be moved, the two ends of it should be firmly drawn through the holes, and fixed with pliers. Every two or three days the ligature should be made tighter ; and this being continued, almost every tooth in this situation may at last be brought into the circle.

It sometimes happens that much deformity is produced by an opening in the anterior part of the jaw, formed either by one or more teeth being accidentally driven out, or from there being a natural want of them. When a surgeon is called immediately on a tooth being driven out, he should instantly replace it ; or if the tooth is broken, or otherwise much injured, he may consult the inclination of the patient with respect to the transplanting of a sound one from the mouth of another person. But patients seldom complain till the injured parts have become inflamed and tumefied, when it is too late to put this method of treatment in practice. In this situation we must wait till the pain and swelling are removed ; when, if more than one tooth is wanting, the deficiency must be supplied with artificial teeth fixed to those which remain firm ; but when one tooth only is wanting, we may frequently, in young people, be able to remove the deformity, by passing a ligature round the two contiguous teeth, so as by degrees to draw them nearer together. Nature will frequently accomplish this, in some degree, of herself : but the operation is commonly slow ; and besides, it is seldom done so completely as when ligatures are employed. By this means the bodies of the teeth are equally drawn together ; but when ligatures are not used, although the teeth, from want of support, will fall nearly together at their points, the opening will commonly remain nearly the same at their roots.

SECTION IV.

Of Gum Boils.

THE gums, like all the soft parts of the body, are liable to abscesses ; but they are more frequent here than in other parts, from the gums being more exposed to causes that tend to produce them. Abscesses may in this situation proceed from cold and from external violence, as well as from every cause that tends to produce inflammation in other parts ; but for the most part we may trace them as the consequences of toothache : and they arise not only from carious teeth, but from inflammation at the roots of teeth, when perhaps in every other respect the teeth are perfectly sound.

A gum boil commonly appears after a fit of toothache has continued for some time. It begins with some degree of pain, attended with a small tumor on the part affected. By degrees the cheek swells ; and this swelling frequently spreads over the whole face, so as to produce much deformity. On suppuration taking place, the small tumor, which is commonly seated on the outside of the gums, exactly opposite to the diseased tooth, begins to point ; and if it be not opened, it generally bursts either through an opening in the side of the gum, or between the gum and the tooth. A quantity of matter is now commonly discharged, by which the patient is in general completely relieved. But as the cause still remains, the discharge likewise continues ; for the disease being most frequently induced by some affection of a tooth, or by a portion of the jaw becoming carious, a discharge of matter usually continues, either till the tooth is removed, or till the carious part of the jaw has exfoliated : or, if the opening happens to close, the disease is quickly renewed ; the swelling returns, and again

goes through all the stages of inflammation and supuration in the manner I have just described. When indeed, the disease proceeds merely from inflammation at the root of a tooth, and when the root happens not to be denuded of its periosteum, after the matter of the abscess is discharged, the sides of it may collapse and adhere, and a cure will in this manner take place : but when it arises either from a carious tooth, or from a carious portion of the jaw, or even when it proceeds from inflammation alone, if the root is laid bare by the matter, the disease will recur from time to time, till the tooth or carious part of the jaw is removed ; for these will continue to irritate the contiguous parts in the same manner with extraneous bodies of any other kind. In the case of a spoiled tooth, we should advise it to be immediately removed ; but when the disease proceeds altogether from inflammation at the root of a tooth, before pulling it every method of a more simple nature should be tried ; and the same means that we employ for the cure of abscesses in other parts, should be put in practice here. When a free opening is formed by the bursting of the abscess, we may sometimes be able to dry up the running, by injecting from time to time lime water, ardent spirits, tincture of myrrh, or tincture of Peruvian bark properly diluted. But although trials of this kind may be advisable with timid patients, who will not submit to other means, we can seldom place much dependence upon them : our surest practice is to lay the abscess open by an incision from one end to the other, and to endeavour to heal it from the bottom, by inserting a small doffel of lint between the edges of the cut, with a view to open them, till a sufficiency of granulations form beneath. This is the surest method of obliterating the imposthume ; and when any part of the socket is carious, it will in this manner more readily exfoliate than it would do were it still covered with the gums.

I have hitherto been supposing that the matter has been collected in the substance of the gums, or between the gums and the tooth, or perhaps that it surrounds the socket of the tooth; but abscesses in these parts are often more deeply seated, when they not only create more immediate pain and distress, but more subsequent risk: for when the more solid parts of the jaw become carious, which they commonly do when the matter of imposthumes gets into contact with them, the cure not only proves tedious, but external marks of a disagreeable kind are apt to ensue from them. With a view to obviate this, the usual practice of applying warm poultices should be avoided; we should rather, by warm fomentations taken into the mouth, and by the application of any warm stimulating substance, such as a roasted onion, to that part of the gum which appears to be most affected, endeavour to promote the formation of any abscess that may point into the mouth; and as soon as matter appears to be formed in it, it ought to be opened without waiting till complete suppuration has taken place.

In the after treatment of the abscess, all that we can do is to preserve a free depending orifice for the discharge of the matter, by which any farther mischief will be prevented, and by which alone we can reasonably expect a cure; for even where the disease is connected with a carious state of the jaw, giving a free vent to the matter is perhaps all that art ought to attempt. If the constitution is otherwise sound, this, together with the removal of any of the contiguous teeth that are diseased, and of such parts of the jaw as are carious, and separate from the rest, will ultimately effect a cure, if this by any means can be done. But in diseased habits of body, especially in scrofulous constitutions, this kind of tumor is always of difficult management, and can seldom indeed be healed till the general disease of the system is removed.

SECTION V.

Of Abscesses in the Antrum Maxillare.

MATTER may collect in the antrum maxillare from various causes : whatever tends to induce inflammation on the lining membrane of this cavity may produce them. Hence they may be induced by blows and other injuries done to the cheeks. Inflammatory affections of the membrane of the nose, and even long continued inflammation of the eyes, by spreading to the contiguous membrane of the antrum, have often an influence in producing collections of this kind ; and much exposure to cold has frequently been traced as the cause of them. But their most frequent origin is pain and irritation excited in the jaw by repeated and violent returns of toothache.

From this account of the cause, the nature of the symptoms will be readily understood. Indeed, if we make allowance for the nature of the parts in which these collections are seated, the symptoms will be found to be nearly such as take place from inflammation and abscesses in other parts of the body. At first some degree of pain is felt over the cheek, and this commonly continues for a considerable time before any external swelling is perceived. On a farther continuance of the disease this pain becomes more severe, and in some instances spreads to the neighbouring parts, so as to create uneasiness in the eye, nose, and ear ; and at last an extensive hard swelling appears over the whole cheek, which sooner or later points at a particular place, most frequently in the centre of the cheek, a little above the roots of the posterior molares. In some instances, indeed, the matter bursts out between the roots of these teeth and the gums, by which the external tumor upon the cheek is prevented from

pointing. This, however, does not commonly happen ; and it only takes place, I imagine, when the roots of the teeth penetrate the antrum, by passing through the palate at the bottom of the socket. For the most part, too, as soon as matter is fully formed in the antrum, we find some of it discharged by the corresponding nostril when the patient lies upon the opposite side with his head low ; and if this frequently happens, it prevents the external swelling for a considerable time from pointing at any particular place, and consequently from bursting, which it would always do if the matter was not discharged in some other manner.

This discharge of matter by the duct leading from the antrum to the nose, does not, indeed, take place in every instance ; but as I have met with it in several cases, I am not inclined with Mr. Hunter to consider the obliteration of this duct as a frequent cause of these collections :* indeed I doubt if it is ever the cause of them. For the most part, they may be traced as the effect of one or other of the causes that I have mentioned ; particularly of toothache, or of inflammation excited by cold, or in some other manner. When obstructions, therefore, happen in this duct, they are rather to be considered as a consequence of the disease : more frequently, perhaps, as the effect of the adhesive stage of inflammation, than as the cause of the collection.

A discharge of matter from one of the nostrils, when it succeeds to pain and inflammation of the cheek, will for the most part be found to proceed from an abscess in the corresponding antrum maxillare ; but we ought to remember that matter may be discharged from the nostrils from other causes ; particularly from an inflamed state of the membrana Schneideriana ; from an ozena ; from affections of the frontal sinuses ; and

* See a Practical Treatise on the Diseases of the Teeth, &c. by John Hunter, F. R. S. &c. p. 44.

from abscesses in the lachrymal sac. In forming our opinion, therefore, every circumstance connected with the discharge, should be taken into consideration, otherwise much disappointment may ensue from our treating one disease for another.

In the treatment of abscesses of the antrum maxillare, nothing will accomplish a cure but our giving a free discharge to the matter : collections of matter, indeed, in this situation, should be considered in the same light with affections of a similar nature in whatever part of the body they may be : wherever matter is discovered, it ought to be discharged ; and in no instance is attention to this more necessary than in abscesses of the antrum maxillare : for if the matter be not discharged, it will distend and elevate the bones of the cheek, and at last render them carious.

With a view to prevent this distressful occurrence, an opening should be made into the antrum as soon as we are convinced, from the nature of the symptoms, that it contains matter. It may be perforated in two different parts. In that part of it which projects outwardly over the two great molares ; or one of these teeth may be taken out, and an opening made into the antrum, by perforating directly upwards in the course of one of the fangs. As most people wish to avoid the pulling of teeth when not entirely necessary, the perforation is commonly made above the roots of the teeth. This lenity, however, proves often hurtful ; for in this manner the perforation must be made in the side of the antrum, by which a depending opening cannot be given to the matter ; nor can it be obtained in any other way than by making a perforation in the manner I have mentioned in the direction of one of the roots of the teeth.

I have already observed, that either of the two large molares may be drawn in order to admit of this perforation. When either of them is spoiled, the diseased tooth should be taken out ; for being carious, there

will be cause to suspect that it may have some share in the formation of the disease : but when this is not the case, we should remove the second great molaris, or that tooth which lies next to the dens sapientiæ ; for although the tooth immediately anterior to this is somewhat more accessible, the difference in this respect is inconsiderable ; and the plate of bone that separates the antrum from the roots of the teeth being thinner in the back part of the jaw than in the anterior part of it, the perforation is accordingly more easily made in it.

On removing one of these teeth, matter in some instances is immediately discharged from the antrum ; owing either to the roots of the teeth having been so long as to pass into this cavity ; or, to the matter having corroded the bone that separates the roots of the teeth from the antrum : in this case, if the opening is sufficient for giving a free vent to the matter, the operation will thus be finished ; but as it is easily enlarged, it ought always to be done where there is cause to doubt that the matter will not be discharged with freedom ; and, when no discharge of matter takes place on pulling the tooth, an opening must be made into the antrum in the manner I have already advised, by pushing a sharp instrument into it in the direction of one of the fangs. A common trocar is usually employed for this, and in general the operation may be sufficiently well done with it ; but the curved instrument represented in Plate XXV. fig. 2. answers better. In making the perforation, the patient should be seated on the floor opposite to a clear light, with his head laid back upon the knee of the operator, who may either stand or sit behind him. The instrument should be withdrawn as soon as it has entered the antrum, which is easily known by the resistance being removed from the point of it. The matter will now flow out freely ; and as soon as it is all discharged, a small wooden plug, exactly the size of the trocar, should be introduced into the opening, with a view to

prevent, not only the air, but the food in mastication, from getting into the antrum ; and when the plug is properly fitted to the opening, it will remain sufficiently firm, while at the same time there is no risk of its slipping in, if formed with a knob or head somewhat larger than the opening.

This plug should be removed from time to time, perhaps twice or thrice in the course of a day ; by which all the matter will be quickly discharged ; and no more being allowed to collect, the disposition to form it will in general be soon removed, and a cure obtained. But in some instances, either from much relaxation of the lining membrane of the antrum, or from a tendency in that membrane to inflame, the discharge of matter does not diminish, but continues nearly the same both in quantity and consistence long after the operation. In this case we may often forward the cure by throwing liquids of a moderate degree of astringency from time to time into the antrum. A decoction of bark is commonly employed for this purpose ; but nothing should be used that contains the least particle of solid matter, as there is always some risk, when liquids not properly filtered are injected, of depositions being left in the antrum ; and in different instances I have seen mischief ensue from this. I commonly employ a solution of alum, or saccharum saturni, brandy properly diluted, or lime water.

When the contiguous bones are sound, a cure will at last be accomplished by a continuation of these means ; but when any of these bones are carious, it will be in vain to expect a cure till the diseased portion either exfoliates, or dissolves and comes away in the matter. By the introduction of a probe, we may always know whether the bones of the antrum are carious or not ; but in general we may rest our judgment on this point on the smell and appearance of the discharge. When the bones are carious, the matter

is always thin and fetid, and it becomes thicker and less offensive as this state of the bone diminishes.

I have hitherto been supposing that the antrum is perforated for the purpose of giving a discharge to matter; but the same operation becomes necessary for the removal of other causes. I once met with an instance of a violent blow on the cheek ending in a large collection of blood in this cavity; and worms that form in it can only be removed by this operation. In what manner worms are produced in this situation, is difficult to determine; but whenever their presence is indicated, by severe pains in the region of the antrum, not induced by toothache or any other obvious cause, there can be no risk in making an opening for extracting them; but in this case there is no necessity for removing any of the teeth. A perforation made into the antrum, immediately above the roots of the large molares, will answer the purpose sufficiently. We should not, however, rest satisfied merely with extracting such worms as appear at the opening: we should inject from time to time such liquids into the antrum as will most probably destroy any that may remain; particularly oil, a filtrated solution of *asafoetida*, and perhaps a weak infusion of tobacco: and the perforation should be kept open for a considerable time, to prevent as much as possible the risk of any worms being left.

I have mentioned the only two parts in which I think the antrum can with propriety be opened; namely, in the direction of the roots of the two large molares of the upper jaw; and immediately above the roots of those teeth on the outside of the jaw. I think it right, however, to observe, that it has been said that a perforation may also be made into the antrum from the nostril. None will doubt of this being practicable; but we might with perhaps equal propriety, say, that an opening may be made into it by entering the instrument from the roof of the mouth. It is evident, however, that it would not be so proper to perforate

the antrum in either of these parts as in those that I have mentioned; and therefore I would not have judged it necessary to notice them here, were it not with a view to give my opinion of this method of making an opening from the nostril; which being proposed by very respectable authority, I think it right that the younger part of the profession, for whom this is chiefly intended, should know that there is much cause to doubt of the propriety of the advice.*

By pursuing the means that I have pointed out, all such symptoms as arise from collections in the antrum maxillare may be removed: but the antrum is liable to swellings of a more hazardous nature, and which frequently do not terminate but in the death of the patient. The tumors to which I allude seem to proceed from an enlargement of the bones of the cheek. No matter is found in the antrum; and therefore no advantage is derived from our making an opening into it. I have in different instances, indeed, observed much mischief ensue from it: for those who are not accustomed with this branch of practice, are apt to be misled by the state and appearance of the swellings; and suspecting that they contain matter, they very commonly make perforations into them, which frequently aggravate all the symptoms by occasioning a more rapid increase of the disease. We should therefore attentively distinguish between swellings of this kind and real collections of matter in the antrum. In the latter, the cheek seldom swells to any great extent; and when the disease is of long duration, if the matter does not find an opening into the nostril, or along the roots of the teeth, it commonly points towards the most prominent part of the cheek. But when no matter is collected, and the disease proceeds from a carious state of the bones, the swelling by degrees arrives at a considerable size, but it spreads

* Vide the Natural History of the Human Teeth, Part II. p. 46, first edition. By John Hunter, F. R. S. &c.

equally over the whole cheek, without pointing at any particular part, excepting in its more advanced stages, when the surrounding soft parts become diseased, matter sometimes forms in them. Till the skin becomes inflamed, which does not happen till the disease has been of long continuance, the swelling remains perfectly colourless; but the most characteristic mark of it is a remarkable degree of elasticity which it acquires. The bones yield to pressure; but they instantly return to their situation on the finger being removed; and if in this state an incision is made into them, which in different instances I have known done, they are found to be reduced to a soft cartilaginous state, and in the advanced stages of the disease to a consistence somewhat gelatinous.

This kind of swelling is of a nature so very obstinate, that hitherto I have scarcely known any benefit derived from any remedy that has been employed for it. In a few cases where it appeared to arise from carious teeth, the removal of the teeth has put a temporary stop to its progress. But even this has never produced any permanent benefit; I mean in the diseased state of the bones that we are now considering; for the cheek is, like other parts of the body, liable to swellings of a more harmless nature, which yield to the remedies commonly employed for them. But in this no material benefit is derived either from medicines or external applications. A long continued gentle course of mercury, along with decoction of mezereon, I have sometimes known prove useful; but neither these, nor any other remedy that I have used, have ever produced a permanent cure.

SECTION VI.

Of Excreescences on the Gums.

EXCRESCENCES of different degrees of firmness occasionally form on the gums : they are all of a red colour, nearly the same with the gums themselves ; but some of them are soft and fungous, while others are firm, and even of a hard warty nature. In some, they are painful ; but for the most part they create no further inconvenience than an impediment in speech and mastication. We meet with them in both jaws, but most frequently in the under jaw, and in the inside of the teeth. In some instances they are connected to the gums by a small neck, but in general they adhere firmly through their whole extent.

This kind of excreescence frequently originates from carious teeth, and in a few instances from a carious state of the alveoli ; in which case the removal of the spoiled teeth, and the subsequent exfoliation of the carious part of the jaw, will often accomplish a cure. Like fungous excreescences in other parts of the body arising from a carious bone beneath, as soon as the diseased part of the bone is removed, the excreescence usually begins to shrivel, and at last disappears entirely : but when this does not happen, it should be removed as soon as it gives pain ; and this should be the more readily done, as the operation is attended with little or no risk. An aversion, indeed, generally prevails against meddling with this kind of tumor, either from an idea of its being cancerous, and that it will probably be rendered more inveterate by an operation ; or from a dread of the hemorrhagy that the operation will induce. I know, however, from experience, that there is no cause to be afraid of this. I have extirpated many tumors of this kind ; and I ne-

ver knew an instance of cancer having followed, or of any hemorrhagy of much importance.

When the excrescence is attached to the gums by a narrow neck, it should be removed by passing a ligature round it sufficiently tight for making it fall off; but when connected to the contiguous parts by a broad base, we are under the necessity of taking it away with the scalpel. The actual and potential cauteries used to be employed for this; but as this practice is now laid aside, and never likely to be revived, I do not think it necessary to speak of it further.

In proceeding to the extirpation of the tumor, the patient should be firmly seated opposite to a clear light, with his head supported by an assistant standing behind. If he is possessed of sufficient resolution, no instruments will be needed for keeping the mouth open; but where we cannot with certainty trust to this, which with children is always the case, a speculum oris becomes requisite. Of this instrument, we have various forms. Those in common use are represented in Plate XLI. fig. 2. and 3.; but they occupy too much space in the mouth to admit of the free application of other instruments. To obviate this, I some time ago proposed the one delineated in the same Plate, fig. 1.; and by experience it is found to answer.

A common scalpel will for the most part answer for dissecting the tumor away; but an operator should always be provided with others, particularly with a curved knife, such as is represented in Plate XXI. fig. 1. and likewise with crooked scissors, such as are delineated in Plate XXXVI. fig. 1. and 2.; for in some cases the roots of the excrescence are more easily separated with a curved scalpel and scissors, than with those of a straight form. But whatever instrument is employed, much advantage may be derived from raising the tumor as much as possible from the parts beneath with a dissecting hook; and for this purpose a hook should be used with two fangs, such as is represented in Plate

XXXVII. fig. 3. In the course of the operation, care should be taken to remove the disease entirely, at the same time that the incision should not be carried so deep as to injure the parts beneath, unless the tumor is firmly and closely attached to them; in which case, it may not only be proper to remove a portion of the gums, but even to go to the depth of the socket: but as this will incur the risk of injuring the contiguous teeth by laying their roots bare, it should never be done when with any propriety it can be avoided.

After the operation, the blood vessels that have been divided should be encouraged to discharge freely: but when the hemorrhagy proceeds too far, it should be restrained, by the patient being made to take from time to time a mouthful of spirit of wine or tincture of myrrh; or if this does not prove sufficient, the application of lunar caustic to the bleeding arteries will commonly succeed.

The situation of the fore renders the application of dressings inadmissible: for some days, however, after the operation, the mouth should be frequently washed with a warm emollient decoction; and afterwards, if a cicatrix does not readily form, the cure may be promoted by the application of lime water, port wine, tincture of roses, and other astringents.

SECTION VII.

Of Loose Teeth.

THE teeth ought naturally to continue firm till they become loose by the ordinary effects of old age: but they are liable to diseases which render them loose, and which even make them drop out at early periods of life; and as this is often the cause of much distress and deformity, it becomes frequently an important object with practitioners.

As the teeth may become loose from various causes, all of which require a different method of treatment, I shall enumerate the most material, and at the same time shall point out those means of cure which seem to be best adapted for each of them.

The teeth are frequently loosened by external violence ; by falls and blows ; and often by an improper use of instruments in pulling the contiguous teeth.

Teeth loosened in this manner, can be made fast only by being kept for some time firmly in their situation ; which may be done by pressing them as far into the socket as they will go, and fixing them with ligatures of Indian weed, catgut, or waxed silk, to the contiguous teeth, and feeding the patient upon spoon meat till they become firm.

In youth, when teeth are loosened by external violence, as the sockets at this age are complete, they readily become firm again when kept a due time in their situation with ligatures : nay, even when forced entirely out of the sockets, they will soon become firm, if they are immediately replaced and retained in their situation. I have in several instances put this method of treatment successfully in practice, and no harm can result from the trial. But in old age, whatever may be the cause of teeth becoming loose, the chance of their ever becoming firm is exceedingly small ; so that in advanced periods of life, it ought never perhaps to be advised.

The teeth sometimes become loose from thick layers of tartar forming over them and passing between their roots and the gums, and in some cases even between their roots and the sockets. In this case, the removal of the cause, if it has not subsisted long, will commonly remove the effect. That the operation, however, may prove effectual, the tartar should be completely scaled off, and it ought to be done early ; for the longer the teeth remain loose, the less chance there is of their ever again becoming firm.

In some instances, they become loose from the gums having acquired a spongy softness, and separating not only at their necks, but often a considerable way down, from the roots. This is sometimes the effect of a long continued course of mercury; but it is commonly, although often improperly, supposed to proceed from scurvy: we no doubt meet with it as a symptom of real sea scurvy: but this is a very uncommon disease at land; while the other, namely, a soft spongy state of the gums, is frequently met with.

When, however, it proceeds from a general scorbutic state of the system, nothing but the removal of this will accomplish a cure; but when entirely local, topical remedies are alone to be trusted. When teeth have remained long loose, we can never with certainty say that any means we can use will render them firm; but the most effectual remedy that hitherto has been employed, is a frequent scarification of the gums: both in the outside and inside of the loose teeth. The incisions should be carried deeply into the substance of the gums: they should be allowed to discharge freely, and repeated from time to time, as long as any of the teeth remain loose. In this manner, that spongy state of the gums that I have described, is often removed, and a disposition produced in them to adhere to the investing membrane of the teeth, by which they often become firm and healthy.

With a view to remove this spongy state of the gums, astringents are commonly prescribed; but I have seldom known any advantage ensue from them: on the contrary, a frequent use of them seems to do harm, by inducing a disposition in the gums, that deprives them for ever of the power of adhering to the parts beneath: at least, I have met with different instances where this was evidently the case; in which by a long continued use of astringents, the gums became so hard and firm, that the scarifications afterwards employed had no effect in fixing them. They should not therefore be used till adhesion takes place

between the gums and teeth, either by means of scarifications, or in some other manner; and this being accomplished, they may be employed with freedom, and even with advantage. The remedies of this class that are most to be trusted, are, tinctures of Peruvian bark, and oak bark, tincture of myrrh, and a strong solution of alum. The mouth should be frequently washed with cold water, strongly impregnated with any of these, at the same time that the patient should be desired not to use the loose teeth, till they have for some time been perfectly firm.

The teeth sometimes become loose by abscesses forming between their roots and the alveoli; especially when the alveoli, from being thus immersed in matter, at last become carious: but this having already been minutely treated of in the fourth section of this chapter, when speaking of gum boils, I must now refer to what was then said upon it.

It is scarcely necessary to mention the loosening of the teeth that occurs in old age; for this takes place from a cause for which there is no remedy: not from the roots of the teeth decaying, or from their being pushed out of their sockets, but from a real annihilation of the sockets; probably in consequence of the osseous matter of which they are composed being absorbed, while nature having now no use for teeth, does not continue to supply it.

SECTION VIII.

Of Cleaning the Teeth.

THE teeth are apt to become foul from different causes, and frequently require the assistance of a dentist to render them clean.

1. They sometimes lose their natural healthy colour, and acquire a dusky yellow hue: or they become to

a certain degree black, without any adventitious matter being perceptible on any part of them.

2. At other times they become foul, and give a disagreeable putrid taint to the breath, merely from a too long remora of the natural mucus of the mouth.

3. But the most frequent cause of foul teeth is a calcareous matter that forms on them, commonly termed the tartar of the teeth, which seems to be a deposition from the saliva, as calculi in the bladder are from the urine. Few people are entirely exempted from this ; but some are much more liable to it than others, insomuch, that I have known different instances, of the teeth becoming thickly incrustated with it in the course of a few weeks after having been completely freed from it.

Tartar first appears in the fore-teeth, and in those parts of them that are least liable to be rubbed by the tongue or lips. Hence it is first perceived on the outside, in the angles between two of the teeth, near to the junction of the gums. The ordinary effects of mastication prevents it in general from spreading towards the points of the teeth : but the disposition to form it is in some constitutions so great, that I have known it proceed from the gums upwards even over the flat surfaces of the grinders ; and in such instances, when not removed, it is apt to spread over the whole teeth, and to give the appearance of a continued incrustation from one end of the jaw to the other. In some cases again, instead of passing over the whole, it seems to fix more particularly on one or two of the teeth ; and in such instances, the deposition of this matter goes on so quickly as to give cause to suspect that the whole calcareous matter of the mouth is by some cause or other attracted to this particular point. I have known one or two teeth completely covered with it in the space of a few weeks, while none of it formed in any other part of the mouth. In some these partial incrustations are so large as to disfigure the external appearance of the cheek ; and, by those

not accustomed to this branch of practice, they are sometimes mistaken for diseases of a worse nature : they have even been treated as exostoses arising from the jaw bone.

While the tartar consists of a thin scale only, and as long as it is confined to the external surface of the teeth, and does not prove hurtful to the gums, it seldom meets with much attention : but when it forms in any considerable quantity, it very commonly hurts the gums, by producing slight ulcerations upon those parts to which it lies contiguous ; or, it insinuates between the gums and the alveoli, so as to separate them to a considerable depth from each other. In either of these events, those means should be employed by which we know that it will be most effectually removed.

When the teeth have remained long covered with any kind of extraneous matter, if it has acquired any degree of firmness, it cannot be removed but with the help of instruments. Even a slight discolouring, although not attended with any perceptible covering of an adventitious matter, when of long continuance, can seldom be removed in any other way. But when once the teeth are thoroughly scaled with instruments, they may in general be preserved in this state by moderate friction with a brush. Frequent washing with cold water ; and rubbing every second or third morning with burnt bread ; Peruvian bark ; cream of tartar ; chalk or any other mild substance in fine powder, will for the most part keep them clean and white : but this we must observe is not universally the case ; for the tendency I have mentioned to foulness of the teeth, especially to a deposition of tartar, is in some instances so great, that the greatest pains and attention does not prevent the renewal of it. This, however, is not frequent ; for it is well known, that due attention to cleanliness will very generally prevent every formation of this kind.

I have said, that when once the teeth have become foul, they cannot be cleaned but with the help of instruments. This is at least the best, as it is the safest and surest method. Rubbing the teeth with acids of a certain strength, will indeed render them white; for the tartar and other kinds of matter that adheres to them being soluble in acids, a frequent use of them removes it completely; and we accordingly find, that acids of one kind or another form the basis of almost every wash that has been advertised for the teeth. The public, however, should be much on their guard against the use of these applications; for the teeth themselves are very apt to be hurt by acids, insomuch that it is perhaps impossible to employ acids of a sufficient strength for dissolving any extraneous matter upon them, that will not at the same time prove injurious to the enamel. Every one knows, that even the mildest vegetable acid will render the teeth rough, and set them on edge: we may therefore suppose, that those of a strong nature, the mineral acids, very commonly used by itinerants for this purpose, must prove much more hurtful; and in fact many have lost their teeth entirely by the use of them.

It is indeed said by many, that in cleaning the teeth with instruments, harm is apt to be done, by hurting the enamel. This I believe has in some instances happened: but it should not be considered as the fault of the remedy, but of the manner of using it. A sharp instrument may no doubt be so improperly applied, as to remove the enamel; but this must always be the fault of the operator: for every incrustation to which the teeth are liable may be taken off with safety, and without hurting the teeth.

In Plate LXXIII. instruments of various forms are represented for this operation. Figs. 2. 3. and 4. are the best, and will answer for most purposes; but the others are sometimes necessary for the removal of such parts of the incrustation as form between the teeth.

They should all be moderately sharp, otherwise the operation is done with difficulty; but the edge of none of them should be fine, otherwise it will be apt to turn, and even to break, with the force necessary for scaling off the tartar.

In performing this operation, the patient should be placed upon a low seat, with his face opposite to a clear light, and his head supported by an assistant. The surgeon himself should be seated upon a chair somewhat higher. It is commonly indeed done while the operator is standing; but I have in different parts of this work had occasion to remark, that surgeons ought to sit at every operation when it can with propriety be done.

The surgeon should now wrap the forefinger of his left hand in a wet cloth, with which he should press firmly upon the point of the tooth intended to be first cleaned, while the back part of the scaling instrument will form a point of resistance for the thumb of the same hand. In this manner the tooth may be firmly supported, so as to prevent every risk of its being loosened by the instrument. This in every case is a necessary precaution; more especially when any of the teeth are loose.

The sharp edge of the instrument is now to be insinuated beneath the under part of the incrustation, care being taken to avoid the neck of the tooth, otherwise, if pushed down this length, and if much force is employed, the tooth will either be loosened, or perhaps turned entirely out. On being certain that the instrument is properly placed, it must be pushed with firmness from below upwards to the top of the tooth, and repeatedly applied in this direction till all the incrustation is removed; and one tooth being cleaned, all the rest that require it must be treated in the same manner. This being done, the teeth should all be well rubbed over with a bit of sponge in the form of a brush, covered with a fine powder prepared of equal parts of cream of tartar and Peruvian bark; and this

being continued from time to time, further assistance will seldom be required : but if, notwithstanding of this, the teeth shall again become foul, any new incrustation must be scaled off in the manner I have mentioned.

This is the best and most effectual method of cleaning the teeth when they become foul from extraneous matter having formed on them ; but they sometimes lose their colour, as I have already observed, and acquire a kind of foulness, when no incrustation is perceived on them : even in this case, as long as the surface of the teeth remains smooth and sound, moderate friction with the edge of a scaling instrument will frequently prove useful ; and if the operation is done with caution, no risk will accrue from it. But when the teeth become black from this cause, we sometimes find the enamel corroded, or perforated as it were with an infinite number of small holes ; and this, I must observe, is the worst kind of foulness to which they are liable : for it is difficult to remove, and when removed, it in general soon returns, nor does it commonly stop till all the teeth which it attacks are destroyed.

As this kind of foulness cannot always be removed with instruments, we endeavour to dissolve it with some chemical preparation. All the mineral acids will do it in the most effectual manner ; but for the reasons I have given, they ought never to be used. I have commonly employed saponaceous, or even pure alkaline applications ; by which the teeth may be often rendered perfectly clean without any injury being done to them. A strong lather of common soap will often answer ; and a solution of salt of tartar applied over the teeth with a small pencil or brush, proves in some instances equally successful.

When in this manner the foulness is removed, the most effectual means for preventing a return of it, is to wash the teeth frequently with cold water, and to

rub them from time to time with one of the powders that I have mentioned. I have sometimes, too, thought, that repeated applications of tincture of Peruvian bark have served to prevent it. As this variety, indeed, of foul teeth seems to depend upon some degree of putrescency ; for it is evidently attended with a caries or mortified state of the diseased teeth ; there is cause to imagine that antiseptics of every kind would prove useful in the method of cure.

For the purpose of applying powders and other applications to the teeth, brushes of different forms, and various kinds of roots properly prepared, are daily used. Lucerne and alkanet roots dried and beat at one end into the form of a brush, are much employed for it, and they may be used both with safety and advantage for cleaning the interstices between the teeth : but neither these, nor any kind of brush should be employed for rubbing the roots of the teeth and upper parts of the gum ; for as their points pass between the gums and the sockets, they are apt to separate the one from the other, from which much mischief is apt to ensue. For this reason, I always employ a piece of sponge fixed in a small handle, which may be used with entire safety.

SECTION IX.

Of Toothache.

TOOTHACHE appears to be more unsupportable than any other kind of pain. It renders all who labour under it very unhappy ; and being one of the most frequent diseases to which the human body is liable, it necessarily becomes a frequent object of attention.

The pain induced by toothache, even when confined to a single tooth, is often productive of severe dis-

trials ; but this is trifling when compared with the consequences that sometimes ensue from it. Instances, indeed, often occur of the most robust constitutions being ruined by frequent returns of it. Besides the usual symptoms of pain in one or more of the teeth, and of swelling in the contiguous gums, the cheek frequently swells to a large size ; the eye, and even the ear of the affected side, are often attacked with pain and inflammation ; and to these, fever, with all its consequences, is apt to succeed.

These symptoms may be induced by different causes, and by affections of the teeth seemingly of opposite natures.

1. They may proceed from the nerve and other parts within the cavity of a tooth being denuded, either by external violence, or by the enamel falling off as the effect of other diseases.

2. They may proceed from inflammation, either of the parts within the tooth, or of the membrane that surrounds the root of it. And,

3. The teeth and contiguous parts of the jaws are often attacked with pain in consequence of what is usually termed sympathy ; that is, they often become pained from affections of distant parts, very severe fits of toothache being sometimes induced by diseases of the eye, of the ear, and stomach. I shall proceed to treat separately of these causes in the order they are here mentioned.

§ 1. *Of Toothache from the Nerve being laid bare, and of the various Methods of extracting Teeth.*

IN whatever manner the cavity of a tooth be exposed, we find from daily observation, that for the most part it excites much pain ; and the reason is obvious. Nature, as we have already observed, has provided the teeth with nerves, but at the same time she has given them a very complete covering of bone : when this protection, therefore, is destroyed, either by accident

or disease, it might à priori be imagined, that these parts which were not formed for being exposed, would suffer various injuries, not merely from the action of food and drink in passing over them, but from the external air being at all times freely applied to them.

But it is not the mere exposure of a nerve, or the violence employed in laying it bare, that produces pain ; it is the consequence of this exposure, the effects that result from it, from which all the ensuing distress originates : of this every practitioner must have met with frequent instances. Thus I have often known the cavity of a tooth laid open by the enamel being broken by a fall or a blow, and no inconvenience ensue but a slight degree of pain ; and it frequently happens, that the enamel breaks off, and the rest of the teeth moulder away without any pain being produced : it is therefore evident, that exposure of the nerve alone is not the ultimate cause of toothache. It is a certain degree of irritability induced by this exposure that appears to be the cause of it ; and to this our views should be directed in the method of cure.

This irritable state of the nerve may be induced by various causes, and more especially by saccharine, acid, and other stimulating substances contained in food, being frequently applied to it ; by the too frequent use of toothpicks, which may often be traced as the origin of toothache ; and by much exposure to a stream of cold air. Exposure to cold, particularly in a damp state of the air, often terminates in toothache by inducing inflammation ; but it frequently excites very severe degrees of pain in teeth already deprived of part of their enamel, when no other symptom of inflammation is discovered.

These are the most common causes of toothache when the nerve of a tooth has previously been laid bare ; and in such circumstances their mode of operating may be easily explained ; but we cannot so easily suggest a reason for this state of a tooth being such

a frequent occurrence, nor does it appear in what manner it is for the most part produced. The enamel is sometimes broken by falls and blows, and it frequently suffers by attempts to break nuts and other hard substances with the teeth : in such cases the cause is obvious ; for we know by daily observation, that the osseous part of a tooth very soon becomes carious, and wastes away on the enamel being destroyed. But how do we account for the most frequent of all causes of toothache, the decay or wasting of the enamel by rottenness, when no evident external violence has been done to it ? It has been alleged, that we may often trace it to a too free use of acids, and by some it is said that it depends most frequently upon a want of cleanliness in not washing or otherwise clearing the mouth of putrescent particles after meals. Particles of food in a state of putrescency, by resting upon the teeth, are supposed to be capable of communicating some degree of their own nature to the enamel ; and putrescency being produced even in a single point, the contiguous parts, it is supposed, will become diseased, from the same cause that mortification spreads in other parts of the body.

I will readily admit that a frequent application of acids, even of the mildest kind, will prove hurtful to the enamel ; and therefore that they should be avoided ; while it is equally clear, that the mouth should be regularly washed after meals, not only for preventing that kind of incrustation upon the teeth that we have already considered, but for preserving a sweetness of breath : it does not, however, appear, that the disease we are now considering, spoiled or carious teeth, depends upon either of these causes. Were it to originate from the too free use of acids, it ought to affect all the teeth equally, whereas it begins almost in every instance in a small point, or spot, which, in general, extends much more slowly than it probably would do if the disease was produced in this manner. And again, with respect to the effect of any putrescent par-

ticles lodging upon the teeth, it is not likely that this disease can be ever induced by them. A piece of meat remaining in the mouth from one meal to another, may acquire some degree of fœtor ; but it cannot probably in that short period become so highly putrid as to destroy the living principle in those parts with which it comes in contact. It is a point, however, which may be easily determined by experiment ; and from the result of some trials that I made for this purpose, there is reason to suppose that the common opinion with respect to it is ill founded. A tooth newly pulled was put into the centre of a piece of putrid beef, and after remaining in it for eight days, it was as free from putrefaction, as when first put into it, neither the enamel nor internal parts of the tooth being in any degree injured ; and the experiment being repeated with teeth that had been pulled for a considerable time, the result was exactly similar. Now, if this happens with teeth entirely dead, even when totally immersed in highly putrid matter, we may fairly conclude, that a partial application of putrescent particles to teeth still enjoying life and connected with the rest of the body, will not be apt to hurt them : for we know, that in other parts of the body, the vital principle has a considerable effect in resisting putrefaction ; and there is no reason to doubt of the teeth being endowed with the same power of self-preservation. But, besides this general argument in support of the opinion, I may remark, that if the common idea on this point was well founded, those parts of the teeth should be most liable to corruption where particles of food are most apt to lodge ; while, on the contrary, those parts of them that are not exposed to this, should seldom suffer. Now, every practitioner knows that this is by no means the case ; for it must be acknowledged, that one part of a tooth is just as apt to become carious as another. The most likely part for food to rest in is between two teeth ; and we allow that the teeth sometimes spoil in these parts, but by no means more

frequently than in other parts not so much exposed to this inconvenience.

It does not appear, therefore, that the causes which have been usually imagined to be most productive of carious teeth have much effect, nor do we know of any incidental occurrence from which, in particular, they can be supposed to proceed : from all the observation that I have been able to make, they seem rather to proceed from some general constitutional cause ; from some tendency in the system to produce a wasting or decay of this particular part. The cause of this again I shall not pretend to explain ; but I think it perhaps equally probable, that this mortification of the teeth depends upon some general affection of the system, as that pain in gout originates from general cause or disposition : instances no doubt occur, of teeth becoming carious evidently from some particular occasional cause, and especially from the enamel being injured by external violence : this, however, is not frequent : it is rarely indeed met with when compared with the frequency of carious teeth ; a disease which in most instances begins without any evident cause, and which in general has subsisted for some time before being noticed.

But allowing that the opinion I have offered upon this point were admitted, it may be asked, to what purpose will it tend ? Will it suggest any difference in the treatment of the disease ? I think it will. As the pain in toothache creates much impatience, and is with difficulty supported, if the pained tooth is carious, it is in general not only the desire of the patient, but the earnest advice of practitioners, to have it extracted, as being the most certain means of obtaining relief. In violent degrees of toothache, when the other remedies usually employed do not succeed, extraction of the diseased tooth ought certainly to be advised ; and in such circumstances no person can be more clearly of this opinion than I am ; but I am equally clear, that, in common practice, this is carried too far, and that teeth

are daily pulled which ought not to be touched. In most instances, the pain is no doubt removed immediately on the diseased tooth being removed; but it commonly happens, that relief obtained in this manner proves only temporary, and that the caries soon fixes upon some other tooth, which soon becomes as much diseased as the first; and this being likewise removed, the disease is apt to proceed from one to another, till scarcely any are left. Of this I have met with many instances, where almost the whole teeth have been successively taken out, one becoming carious soon after another was removed. Nor is there even at last any advantage gained by the practice; for, after all the teeth are taken out, the pain often remains equally severe in the jaw itself.

The frequent occurrence of this tends much to establish the opinion of carious teeth being often a constitutional disease; and it likewise suggests the propriety of extracting teeth less frequently than is commonly advised. As we can never at first be certain whether toothache depends on a general cause or not, it is perhaps right in every case to extract the first, and even the second tooth that becomes diseased, as soon as the fits become frequent and severe: but whenever the disposition is so strongly fixed in the system, that a third or a fourth soon become diseased, the patient should be advised rather to submit to a good deal of distress than to extract any more; and it often happens, when he has resolution to submit to one fit of the toothache, and to wait till it is completely over, that he never afterwards, in this tooth at least, feels any return of it. Cases no doubt occur in which this does not happen; but it happens often enough to warrant the propriety of giving it a fair trial in perhaps every instance: even where it fails, no harm is done by the trial; and when it succeeds, the advantage gained by it is great. For a considerable time I adopted the common practice on this point in its full extent: every carious tooth attended with pain I advised

to be pulled ; but finding in general that no advantage was derived from it, the result being for the most part nearly as I have already described, I was hence induced to depart from it ; and now, after a patient has had a tooth or two extracted, if the disease still continues to return, I never advise the practice to be pushed farther, unless when the pain is so severe as to be unsupportable, which, however, is not often the case. By avoiding exposure to cold during the fit, and by exhibiting doses of laudanum proportioned to the degree of pain, the distress produced by it is at last in general removed ; and by due attention to cleanliness, particularly by frequently washing the mouth with cold water, and, when practicable, by stuffing the opening in the carious tooth so as to prevent the access of air, many have been saved, not only from the pain and distress of pulling teeth that became first affected, but of losing others, which probably would have become carious if the common practice had been followed of extracting all diseased teeth as soon as they become painful.

Having thus endeavoured to show that carious teeth are most frequently produced by some general constitutional cause, I shall now proceed to consider more particularly the means to be employed, not only for preventing, but for removing toothache depending upon this cause,

In cases of carious teeth, it is the prevailing practice to remove the black or mortified spot with a file, in order to prevent it from spreading ; but, so far as my observation goes, the practice ought not to be followed ; for the diseased part of a tooth can never be removed without exposing those parts that remain to a more free access of air than that to which they were previously liable ; and therefore instead of proving useful, I have almost universally seen it do harm. In many, I have known it induce pain where none existed before ; and instead of preserving teeth, it frequently seems to have the effect of rendering the remain-

ing found parts of teeth sooner carious than they might have become if they had not been touched. I therefore do not hesitate to say, that this practice of filing should be exploded; and whoever considers the necessary effect of it, will probably be of the same opinion. It is evident that the part of a tooth already carious cannot be sensible of pain. For what purpose, therefore, should it be removed? while it remains, it serves in some degree to cover and protect the sound parts beneath; while by taking it off, they are left perfectly bare, and apt to be hurt by whatever is taken into the mouth.

When, again, as much of the enamel is removed, either by caries or external violence, as to form a cavity in a tooth, we have it frequently in our power to prevent the accession of toothache, by stuffing or stopping up the opening, so as to prevent the air and particles of food from getting access to the nerve. Different substances are employed for this: such as gum lac, mastich, olibanum, beeswax, sealingwax, tin, lead, and gold. When the opening made by the disease is large, and especially when narrow at the bottom, and wider outwardly, mastich and gum lac, or even beeswax, will sometimes answer, when none of the harder substances will remain in the cavity: but all of these being soft or friable, they are quickly rubbed down in mastication, and require to be frequently renewed; so that some of the metals are preferable when the form of the opening admits of their being employed, which is always the case when the tooth is much scooped out inwardly, with a small hole leading into it. Gold leaf is sometimes used; but nothing answers so well as common tinfoil. As much of it should be cut off as will probably be needed; and one end of it being pushed into the hollow of the tooth with the instruments, fig. 6. 7. or 8. Plate XLV. the rest of it should be gradually pressed in till the cavity is filled; and this being done, any portion of the tin that remains should be cut off, and the surface of

the whole made smooth by frequent rubbing with the burnisher, fig. 9. of the same Plate. But before any attempt is made for stopping a tooth, the nerve should be rendered quite insensible; for till this is done, the patient will not be able to bear the pressure which fixing the tin requires. In general the nerve becomes sufficiently callous, merely by delay: but when this does not answer, we may often effect our intention by inserting daily into the cavity of the tooth a few drops of oil of origanum, thyme, or any other essential oil; by which any slight degree of irritability in the nerve is often removed, so as to admit of pressure being applied to it with freedom.

I have already observed, that neither tin, lead, nor any hard substance, will remain in the hollow of a tooth unless the opening into it is narrow. It has however been proposed, when the opening is of a different form, and when the stuffing cannot be fixed in any other manner, to do it by drilling a small hole through the sides of the tooth; so that when the lead is pressed down, it may be retained by passing a peg of silver, gold or any other metal, from one side of the tooth to the other. In a few cases this may succeed; but it will not answer either where the opening is wide outwardly, or where the sides of the tooth are not firm, as in such circumstances is often the case; for where the external opening is wide, even a peg passed through the centre of the stuffing will not keep it sufficiently firm to prevent some parts of the food from finding access to the parts beneath; and, when the remaining part of the tooth is thin and brittle, it will be apt to break in making the hole.

When, however, by any of the means that I have mentioned, the hollow of a tooth can be properly stopped, it will not only prove the most effectual method of preventing frequent returns of toothache, but will have some influence in preserving the remaining part of the tooth. I have known various instances of this where carious teeth have been preserved for a

great number of years, without being productive either of pain or any other inconvenience ; but this requires the cavity to be completely stopped, so as to prevent either food, drink, or even air, from finding access.

When a person with carious teeth has been liable to frequent fits of toothache, besides stuffing the hollow teeth in the manner I have mentioned, he should attentively avoid exposure to cold : his head should be kept warm with flannel coverings through the night ; and he should live in a dry situation. Indeed, a moist atmosphere proves so destructive to the teeth, that people living in wet situations find it exceedingly difficult to preserve them ; and I have known various instances of frequent returns of toothache being prevented entirely, by the removal of the patient from a damp to a dry situation : nay this will sometimes succeed when every other means have failed.

By due attention to these means, much may be done in preventing people with carious teeth from suffering so much as they otherwise would do : but, notwithstanding of all our endeavours, teeth in this situation are very apt to become painful, and are often productive of much misery ; so that the most effectual method of lessening or removing this is often a very important object.

Some varieties of toothache may be removed by remedies applied to other parts of the body. Thus when pain occurs in a tooth, as it sometimes does, from inflammation first beginning in the ear, it may be more effectually removed by applying a blister behind the ear than by any other means : or when a foulness of the stomach is the cause of it, an emetic proves the most effectual remedy. This I shall afterwards consider more particularly ; but when toothache proceeds from the nerve of a tooth being laid bare, it will seldom happen that any remedy will answer that is not applied directly to the part itself. Bark, electricity, and a variety of nostrums, are fre-

quently employed ; but in this variety of toothache, the only remedies that I have ever known prove useful, are, anodynes, corrosive applications, and extraction of the tooth.

In slight degrees of toothache, the pain is sometimes relieved, or even altogether removed, by applying either opium or laudanum directly to the bare nerve : I have known camphor too prove useful, both by itself and when conjoined with opium ; and it sometimes answers in a liquid form, dissolved in spirit of wine, when it does not succeed in any other way : æther may be likewise mentioned as a remedy in toothache ; but as these and other applications of a milder nature do not commonly succeed, we are for the most part obliged to employ others of a more active kind, with a view to destroy the nerve entirely.

A long continued use of any of the strong essential oils will in some cases, as I have already observed, render the nerve callous or somewhat insensible, but they never destroy it so entirely, as to prevent the risk of future returns of toothache. This, however, may be done by remedies of a different kind ; by spirit of vitriol or any other concentrated mineral acid ; by inserting a bit of lunar caustic into the cavity of the tooth ; or by burning the nerve with the actual cautery. But, in using either the lunar caustic or any of the strong acids, much attention is necessary to prevent the contiguous parts from being hurt ; for if not inserted with much caution, they are apt to spread and do much harm : the actual cautery may, however, be employed without risk : but that it may prove effectual, the hot iron must be pushed farther into the hollow of the tooth than patients in general will allow ; for if the nerve be not destroyed to the very extremity of the root, no advantage will be gained ; and this being both tedious and painful, we meet with few that agree to it ; but when properly applied, we have it in our power entirely to destroy the nerve : It may be done with a piece of small wire made sharp

at the point, or with the instrument represented in Plate XLV. fig. 8.

It often happens, however, that none of these remedies answer, either from their not being duly applied, or from practitioners not pushing them so far as they ought to do. In this case, when the pain continues violent, we are under the necessity of destroying the nerve in a different manner, namely, by the extraction of the tooth; and this being done, if the tooth is not much spoiled, and if it be not broken in the operation, after the socket is cleared of blood, it may be replaced in the manner I shall afterwards mention when treating of the method of transplanting teeth. This will not always succeed, especially in the molares; but in the back part of the mouth it is not so necessary as when the incisores or canine teeth are taken out, when it often answers. And when a tooth thus replaced becomes firm, it proves equally useful as before; while, from the total destruction of the nerve, it is not afterwards apt to produce pain. I shall now proceed to consider the method of extracting teeth.

The pulling of teeth being a frequent operation, much pains has been taken to perform it with as much ease as possible; and although it still necessarily gives pain, it is now done both with more ease and safety than it could possibly be in former times, while the instruments employed for it were rude and imperfect.

It is evident that a tooth may be pulled in different directions: it may either be pulled in a perpendicular direction with respect to its roots; or it may be made to turn upon its axis, by depressing the corona or upper part of it, by which the point of the root will be proportionally raised; or a sufficient degree of force may be applied for pushing it out of the socket in a lateral direction.

If these methods of operating were all equally practicable, we would not hesitate to fix the preference: in raising a tooth perpendicularly, much less violence must be done to the contiguous parts than by forcing

it out in a lateral direction: for as the roots of the teeth are all firmly fixed in bone, they cannot possibly be pressed out laterally, but with such a force as is sufficient for breaking or bursting open that part of the alveolar process of the jaw bone with which they are surrounded; and as this must produce both laceration and contusion of the gums, it is necessarily productive of much pain: but as all the space we can obtain, even by the greatest wideness of the mouth, will not admit proper instruments for moving the teeth in the back part of the mouth in a perpendicular direction, we are for the most part under the necessity of using such as move them laterally. All the incisores and canine teeth may indeed be taken out in a perpendicular direction, and even some of the molares, when they are loose; but when the molares are firmly fixed, no instruments with which we are acquainted will pull them in this manner. Various proposals have been made for this purpose; but although hitherto every attempt has failed, some farther trials may perhaps render our instruments sufficiently perfect for effecting it.

The only instruments of which practitioners in former times were possessed for the extraction of teeth, were different kinds of forceps or tenets, named according to their form, hawks bills, cranes bills, &c. and different kinds of levers, both straight and crooked. These, however, were rudely constructed, and it was with much difficulty that teeth firmly fixed were moved by them. In process of time, therefore, various improvements were proposed on them; but few of these being of much importance, it is not necessary either to describe them, or to give delineations of them; especially as they may be seen in the works of Garengeot, Scultetus, Hildanus, and other writers of the 17th and preceding centuries. All that I mean to do, is to delineate those instruments that are approved of by modern practitioners of reputation; to propose

such improvements upon these as by experience have been found to prove useful; and to give a detail of the method of using them.

For a long time past, an instrument termed a key has been almost the only one employed in Britain for extracting firm teeth, and it is now very generally used in different parts of the continent. Different forms of it are delineated in Plates XLVI. and LV.

In operating with this instrument, if the tooth to be taken out is in the under jaw, the patient should be seated in a chair, while his head should be supported by an assistant behind; but if in the upper jaw, he should be seated upon a pillow, with his head turned back, and supported upon the knees of the operator, who in this case must stand or sit behind him, whether the tooth be in the right or left side of the jaw: but when a tooth is to be extracted from the under jaw, if it is on the right side, the operator should be placed somewhat to the left; and, *vice versâ* when the tooth is on the left side, the surgeon should place himself somewhat to the opposite side. That the instrument may be applied with as much freedom as possible, as well as to prevent the gums from being lacerated, all the soft parts adhering to the teeth should be separated, by insinuating between them the point of the scarificator, fig. 1. Plate XXXVII.; and this being done, the operator must proceed to the application and use of the key.

The patient having cleared his mouth of blood produced by separating the gums from the tooth, the point of the claw, Plate XLVI. fig. 1. must be pressed as far down between the gum and root of the tooth as possible; and in this situation it must be firmly fixed and retained with the forefinger of the left hand, while the fulcrum C, being placed as far down as it will go upon the gums on the opposite side of the tooth, the operator must now with his right hand apply such force as may be sufficient to move it; and by turning the handle firmly round, almost any tooth may be taken

out at one pull without raising the instrument : but whenever a tooth proves to be firmly fixed, and especially if it is one of the large molares whose roots diverge considerably, it is better, after it is freely loosened, to remove the instrument ; and having turned the claw to the opposite side, to apply it so as to turn the tooth to the other side of the jaw, by which it will be made so completely loose as to be easily taken out with common teeth forceps, Plate XLVIII. fig. 3.

In using the key, when the tooth to be taken out is firmly fixed, especially when there is no vacant space between it and the contiguous teeth, some care is necessary to prevent these last from being loosened. When it cannot be done in any other manner, the edges of the tooth to be removed, should be filed down with a thin file, and it may be done without hurting the neighbouring teeth, by using a file that is smooth or polished on one side.

This I believe to be the best method hitherto known of extracting firm teeth from the back part of either of the jaws ; and the incisores and canine teeth may likewise be pulled in the same manner : but these, namely, all the fore-teeth, as well as loose teeth in every part of the jaw, may be pulled in a different manner, which I shall afterwards describe.

Although there is some difference of strength, as I have already observed, between the outer and inner plates of the alveoli of the teeth, the difference is so trifling, that in pulling a tooth it merits little consideration. Neither does the direction of the roots of teeth deserve attention in this operation : for although it is alleged by some, that they may be turned with most ease towards the inside of the mouth, from their roots being supposed to spread towards the outside of the jaw ; yet this is by no means the case. For the most part, the roots of the large molares diverge equally towards both sides of the jaw ; so that in this respect they may be pulled with the same propriety to the one

sider as to the other. But the two last molares of the lower jaw afford an exception to this ; for they are so situated, that in every instance where the common key is employed, they should be turned inwards. The basis or origin of the coronoid process forms a strong sharp ridge on the outside of the jaw, exactly opposite to the roots of these teeth ; so that, when turned outwards, as the heel of the instrument must rest upon this ridge, the gums which cover it are necessarily much bruised. When a tooth is much spoiled on one side, it is almost the universal practice in pulling it, to fix the point of the claw on the sound side ; and this being considered as necessary, may be given as a reason for our being obliged in some instances to turn even one of these teeth towards the outside of the jaw. This, however, is not on experience found to be the case ; for, in general, it is supposed to answer best to fix the claw of the instrument on the soundest side of a tooth, and to turn it to the opposite side ; yet with due pains and attention, we might perhaps in every instance follow the very reverse of this with equal success : for with a proper application of the scarificator, we may almost always separate the gums, so as to be able to press the point of the claw far enough down upon the root, and in this manner to turn it with ease to the opposite side.

The key instrument, however, may be made so as to turn even the two farthest molares outward, without doing any injury to the gums lying above the process that I have mentioned. A form of it for this purpose is delineated in Plate XLVI. fig. 3. which I proposed several years ago, and which I have often used. By the heel of the instrument resting upon the gums beneath the first great molares, while the claw is bent in such a manner as to apply to either of the two posterior teeth, they may in this manner be turned out with safety. The heel should be made long, so as to pass far down upon the gum ; otherwise, for this particular purpose, it will not answer so well. In-

deed the heel of the key instrument should be always longer than it is usually made ; for when short, it acts with much less power, and is more apt to break the tooth, than when made of a greater length. The contrary of this I know has been much inculcated ; but after giving a fair trial to both methods, I am now convinced that the key with a long heel is much preferable to the other. The chief objection to the use of a long heel is, that it must bruise the gum more than a short one. This, however, is not the case, as will be readily allowed by all who attentively think of it ; for even the shortest heel must press upon some part of the gum ; otherwise, if applied upon the tooth itself directly opposite to the point of the claw, as some have advised, it will act in nearly the same manner, and with no farther power than common forceps : while, again, a long heel does not, as is commonly imagined, injure the gums in proportion to its length ; for although the flat side of it is applied to the gums at first, as soon as it begins to act, the farthest point of it only will be found to touch them ; and accordingly this part of the heel, as well as all the rest of it, should be made as smooth as possible ; so that in turning upon the gum, it will do less harm than when of a rough surface according to the usual form.

I have already observed, that in pulling teeth, the side to which they are turned need not be much regarded, from any difference of strength between the outer and inner plates of the alveoli or sockets ; for in this respect they are nearly similar. But even although the difference was more than it really is, it would not merit attention ; for, in pulling teeth in the manner I have described, namely, in an oblique or lateral direction, it is evident that the sockets must be broken on both sides ; at least this must be always the case where the roots of a tooth are of the usual length, and not shortened, as they sometimes are by disease ; for while the corona of a tooth is forced down upon one side of the socket, the point of the

root must necessarily be turned in nearly the same proportion upon the other. The softer parts will not indeed suffer so much, as they will not be bruised by the heel of the instrument ; but the socket must obviously be much hurt by it ; so that in every point of view, little or no consideration is due in this operation to any supposed difference between the strength of the two plates of which the sockets of the teeth are formed.

But as it is of much importance to save both sides of the alveoli as far as possible, nothing should be omitted that can with propriety be done for their protection. For this purpose, a form of the key instrument has been proposed, for supporting the gums and alveoli, while the tooth is raised and separated from them by turning the instrument in the usual manner. But if the socket is supported, and not allowed to yield on the tooth being pressed towards it, there is much reason to fear that the tooth itself would break ; and if the instrument be not applied in such a manner as to have this effect, it will answer no other purpose than the key in common use ; while, being more complex, it is managed with more difficulty. The proposal however is ingenious, and may lead to improvement in the operation of tooth-drawing.*

In pulling a tooth with the key instrument, it is the common practice to force it out at once. But although this may sometimes succeed, it ought not to be tried ; for when the roots of teeth diverge much, or when any portion of the fang is enlarged, as is sometimes the case, we run much risk, by this method, of breaking them, at the same time that the socket must be much more injured than when the tooth is loosened in the manner I have advised, by turning it first to one side and then to the other with the key instrument, so as to be able afterwards to take it out

* This instrument is the invention of Dr. John Aitken. For a more particular account of it, see *Essays on several important Subjects in Surgery.*

with common forceps. And if this is done slowly, with a gradual equal pressure, and if the heel of the key has been properly covered with several plies of soft linen, scarcely any harm can be done by it : but instead of this, when the instrument is applied directly to the gum, without the intervention of any soft substance, and the tooth turned out, as is frequently done, by a sudden jerk, the gums are not only greatly bruised and lacerated, but the socket is more severely injured, at the same time that the tooth itself is under a greater risk of being broken than when pulled in a more gradual manner. It is natural for patients, ignorant of the risk attending it, to wish for the operation to be quickly done ; but it is unpardonable in practitioners to indulge them in this, when a moment's reflection must convince them, that a tooth cannot be quickly pulled but with much risk, either of the jaw or it being broken.

Even when the operation is done in the most cautious manner, troublesome accidents sometimes ensue from it : and these particularly are, contusions of the gums ; splinters of bone being separated from the jaw ; and alarming hemorrhagies.

Laceration and contusion of the gum being a very painful part of the operation, we ought, as far as possible, to guard against it ; not merely by covering the heel of the instrument in the manner I have advised, but by declining to use it while the gums are much inflamed ; for while much inflammation continues, the operation necessarily gives much more pain than it otherwise would do. For obviating the effects of laceration, when any portion of gum is much separated from the rest, it should be cut off with scissors ; the mouth should be fomented from time to time with warm milk, or any emollient decoction ; and when there is cause to imagine that suppuration will take place, it should be encouraged by the application of roasted figs or onions, by way of cataplasm. In this manner, if an abscess occurs, it will be soon brought

to maturation ; when, if it does not burst quickly, it ought to be opened : and again, in slighter contusions, nothing alleviates the pain induced by them so effectually as the applications I have mentioned.

When the socket only has suffered, little or no harm ensues from it ; so that it is seldom necessary to mention it even to the patient. But when the splinter extends to the more solid part of the jaw, which in children especially is apt to happen if the operation is not done with the utmost attention, as the sore that ensues proves commonly tedious, and does not readily heal as long as any loose pieces of bone remain in it, any of these that are perfectly detached should immediately be taken away ; but as they are seldom so completely separated as to come easily away at first, no force should be used in it, as they afterwards either fall out of themselves, or may be easily taken away on a free formation of matter taking place. After this, if the matter is prevented from lodging, and if the constitution is in other respects sound, the sore usually heals with ease.

Hemorrhagies of importance are not frequently produced by tooth-drawing ; for the blood vessels of the teeth being small, it is scarcely possible that they can discharge much blood. But when the roots of teeth are deeply fixed in the jaw, and when much force has been used in the operation, we can easily suppose that in this manner some of the larger arteries of the contiguous parts may be divided ; and it is thus I imagine that any troublesome hemorrhagy is ever produced by this operation. At first we advise the patient to take frequent mouthfuls of cold water, red wine, brandy, vinegar, or even alcohol ; and for the most part one or other of these prove successful ; but when they happen to fail, other means must be employed, and the most powerful of these is compression. A doffel of soft lint, fitted to the opening, must be pushed into it ; and the patient being desired to compress it by keeping his mouth shut, if this is properly done,

it does not commonly fail. I have met with instances however, even of this proving unsuccessful, and of fainting and other distressful symptoms being produced by the hemorrhagy. In this situation the actual cautery is alone to be trusted; and it must be applied with freedom, otherwise no advantage ensues from it. A small bit of lunar caustic inserted into the opening might answer; but it does not act with such certainty as the other, while there is more risk of its doing harm, from its being apt to spread so as to injure the contiguous parts.

The key instrument is perhaps the best hitherto invented for the pulling of teeth in an oblique or lateral direction; but we have several others that act nearly on the same principles: these, however, being less perfect, I shall not delineate them all here; but with a view to convey some idea of them to such as may not have other opportunities of seeing them, I have given a representation of two of them in Plate XLVII. figures 2. and 3. But even these, although the best with which I have met, are far inferior to the key: for they act with much less power; and they have this material defect, that they can never be employed for pulling teeth towards the inside of the mouth.

I have thus described the method of extracting firm teeth from the back part of the mouth. Any of the fore-teeth may likewise be pulled, as I have already observed, with the same instruments; for they may be turned either inwards or outwards, by a proper application of the key; but they may also be pulled in a different method; and as this may be done with instruments that do not bruise the gums, they should perhaps in every instance be pulled in this manner.

The incisores and canine teeth, and even the two small molares have only one root; so that they are never so firmly fixed in the jaw as the large grinders; and they may be extracted with more ease. For the most part this may be done with the common teeth forceps represented in Plate XLVIII. figs. 1. 3. or 4.

In using this instrument, it should be pressed as far down upon the tooth as possible, otherwise it is apt to break off the corona or upper part of it, and to leave the root; and the tooth should not be pulled directly upwards, but twisted alternately from one side to the other till it becomes loose, when it may be taken out without further trouble.

In some cases, however, even the fore-teeth are too firmly fixed to admit of being pulled with this instrument: I have therefore given a representation of forceps that act with more power; a very ingenious invention first made public in the *British Magazine*, in the year 1762. It is delineated in Plate XLIX. figs. 1. and 2. Fig. 1. represents a common strong forceps with moveable claws. The axis of the claws is shown at A. Fig. 2. is a fulcrum. B, C, is the handle going off obliquely from B, by which it is more easily applied. B, F, D, is a plate of iron covered underneath with a piece of soft buff; and E is the other side of the same plate made round, smooth, and uncovered. The tooth intended to be pulled is laid fast hold of with the forceps, fig. 1.; then the fulcrum B, F, D, is placed upon the neighbouring teeth, when the forceps being placed upon the round part of the plate E, by a proper motion of the lever G, H, I, K, the tooth is in this manner extracted. In the pulling of loose teeth, this instrument may be used so as to draw them nearly straight up; and this we are told may even be done where the teeth are firm, provided their roots do not diverge much, and that there are no osseous adhesions between them and the sockets: but with a view to prevent any bad consequences that might ensue from the application of much force, we are desired by the anonymous author of the instrument, instead of attempting to pull firm teeth directly upwards, to twist them outwards, which loosens them so much, that they may then be pulled in a perpendicular direction with much ease.

The advantage supposed to be derived from forceps with moveable claws is this : when common forceps is used with immoveable claws, if the tooth is firm, it must either be forced out obliquely, or the first hold must be lost, and the instrument fixed again : but when the claws are moveable, the instrument retains its hold, so that the tooth may be pulled nearly in a perpendicular direction ; for the claws, by turning upon centres, will always fall into the way of the tooth ; and will therefore raise it nearly in a straight line.

I have taken different opportunities of observing, that the most painful part of tooth drawing arises from the bruising and laceration of the gums and sockets ; a circumstance that cannot be altogether avoided when the key instrument is employed. The great object of the forceps that I have just described being to pull in a straight direction, by which the gums and sockets are almost entirely saved, would render it the most complete instrument that hitherto has appeared, were it not liable to some very important objections. The ingenious author of this forceps thinks it may be employed for the extraction of any teeth ; even of the large molares ; but as the mouth cannot be so widely opened as to admit of our applying it properly, this attempt should not be made with it : it must therefore be confined, as I have observed already, to the pulling of teeth in the forepart of the mouth. But besides this, as the fulcrum is placed upon the contiguous teeth, when the tooth to be pulled is firmly fixed, it is scarcely possible to prevent these from being hurt : for they will be very apt to suffer even when the pressure is made as nearly as possible in the direction of their roots ; and when this is not done with accuracy, they are apt to be broken, or even forced entirely from their sockets. In the pulling of loose teeth, however, and whenever the fore-teeth are not so firmly fixed as to require much force to move them, this instrument may be employed with advantage. When, again, it is discovered upon trial, that an unusual degree of

force is necessary, a prudent practitioner will rather lay the forceps aside, and finish the operation with some other instrument. The common key, as I have already observed, may be used ; or either of the instruments, fig. 1. and 2. Plate XLVII. may be employed for loosening the tooth ; after which it may be taken out either with these or with common forceps.

I have hitherto been supposing that the tooth to be pulled is only carious in a particular part, and that a considerable part of the corona is still remaining. When a tooth becomes so much diseased that the upper part of it falls entirely off, so as to leave little or nothing above the gums, the remaining part of it is thus reduced to what is commonly termed a stump.

In this stage of the disease, the connection between the roots that remain and the sockets, undergoes a very important change. By the corona being removed, the roots, whatever number there may be, are all separated from each other ; for being united solely through the intervention of the corona, their connection must evidently be destroyed on this being taken away. In this manner their connection with the sockets becomes less firm, than when diverging roots, tied together above, tend all to support each other ; but they become still more loose by a dissolving or wasting process, to which teeth in this situation are always liable. A considerable part of the corona of a tooth may become carious, and fall away, without the roots being affected ; but I have scarcely known an instance of the corona being completely removed for any length of time, where the roots did not suffer a remarkable diminution. Nay, in some cases, the roots, even of the largest molares, have been almost completely annihilated ; and instead of the long fangs with which these teeth in a state of health are furnished, only a small point or two of spoiled bone has been met with. In consequence of this they become loose ; and their connection with the jaw being now very superficial, they may be forced out much more easily than a large

tooth. I know that practitioners in general are not of this opinion, the pulling of a stump being for the most part considered as more difficult, as well as a more painful operation, than the extraction of a large tooth. This, however, can proceed only from want of experience in this branch of practice; for those who are more versant in it know, that there is much more pain, hazard, and difficulty, in the pulling of a complete tooth when firmly fixed, than in the taking out of several stumps.

When the point of the claw can be forced so far down upon a stump as to get a firm hold, it may be pulled with the key instrument in the manner I have advised for the extraction of large teeth; but this should not in general be done, as we may commonly employ a sufficient force with instruments that do not injure the gums, and by which a very painful part of the operation may be avoided. When the stump can be laid hold of, either with common forceps, or with those with moveable points, this, as the easiest method, should be preferred: but when so much spoiled, as to be nearly, or perhaps entirely, covered with the gums, the points of forceps cannot be pressed sufficiently down upon it; in which case, we are under the necessity of forcing it out with a simple lever. This instrument is commonly termed a punch; of which different forms are represented in Plate L. figs. 1. 2. and 3. In using it, the gums must be freely separated from the stump with a scarificator; and the point of it being pressed down upon the root, a degree of force must be applied with it, sufficient for raising the root from the socket; and this being done with one of the fangs, the instrument must, in a similar manner, be applied to the others.

With those accustomed to the use of the punch, this operation is simple and easy, while with others it proves both tedious and difficult. With a view to apply as much force as possible, the point of the instrument is commonly pushed as far as it will go towards the root

of the fang ; but by this means much of the force is lost against the alveoli of the opposite side ; which being firmer and stronger towards the base of the jaw, do not so readily yield at this part as where they are thinner and not so firmly supported. It answers better to push the instrument no farther down upon the fang than is merely necessary for procuring a sufficient rest for the point of it ; for I know from experience, that a stump may be forced out in this way with more ease than in any other manner. When the punch does not force it out entirely, but serves merely to loosen it, it may in this state be laid hold of with the forceps, and removed in the manner I have pointed out.

For the most part, a punch of the form represented in Plate L. fig. 1. answers best. With this the force is applied so as to push the fang towards the opposite side of the jaw ; but it sometimes happens, that the upper point of the root is of such a form as does not readily admit of force being applied to it in this direction ; in this case we employ a kind of hook or crooked lever, such as is represented in fig. 3. by which the stump is drawn or raised in a contrary direction.

I have thus described what, by experience, I have found to be the surest and easiest method of extracting teeth. A variety of instruments may indeed be met with in other authors, which I have not mentioned, and by which, it is said, by their inventors, that the operation may be done with more ease. But this not being supported by the result of practice and observation, it will not be expected that I should give any account of them.

§ 2. *Of Toothache from Inflammation.*

THE ordinary symptoms of toothache arise, for the most part, as I have already remarked, from the nerve being laid bare, either from a tooth becoming carious, or from the enamel being broken by external violence.

It sometimes happens, however, in a very violent manner, merely from an inflamed state of the membrane surrounding the root of a tooth, or from the parts within the body of the tooth becoming inflamed. We judge of this being the cause of toothache, when a severe permanent pain attacks a tooth that outwardly appears to be sound: and this especially when it has been evidently induced by much exposure to cold, or when it is connected with other symptoms of inflammation, such as an inflamed state of the contiguous cheek, or swelling and suppuration in the adjoining gums.

In most instances, we may be able to trace this variety of toothache to this cause, namely, exposure to cold; in some cases, however, it proceeds from causes of a different nature. Whatever excites inflammation in other parts of the body, will produce the same effect when applied to the membrane that surrounds the root of a tooth: and we know from experience, that inflammation of this membrane is sometimes induced by a disease to which the roots of the teeth are liable; what is termed the swelling of the fang, a hard knot or exostosis that sometimes forms at the point of the root. At first, the pain induced by this may be supposed to originate altogether from distention; but ultimately it commonly terminates in a very severe degree of inflammation. And inflammation of these parts, by whatever cause it may be induced, is always attended with more violent pain than what commonly takes place from similar affections in other parts, owing to their being here surrounded with bone, which prevents them from yielding so readily to that distention of the vessels that always occurs in inflammation.

In the treatment of this variety of toothache, we find, in general, that those remedies prove most useful which answer best in inflammatory diseases of other parts. Local bloodletting, either by scarifying the gums with a lancet, or by the application of leeches, often gives relief. I have known the pain removed

by the application of a blister to the contiguous part of the cheek ; and much advantage is often derived from a large dose of laudanum : by procuring a temporary diminution of pain, it thus lessens irritation, and hence an abatement of the inflammation itself. The head should be kept warm with coverings of flannel ; a practice that should be inculcated with all who are liable to toothache, from whatever cause it may proceed, but particularly when it originates from inflammation ; and in this case, fomenting the head with the steams of emollient herbs, or even of warm water alone, will often procure relief when every other remedy has failed. In some cases; indeed, cold water, vinegar, or ardent spirits taken into the mouth, prove serviceable ; but for the most part, warm applications prove more useful in this variety of toothache.

By duly persevering in the use of one or other of these remedies, the pain will commonly be at last removed ; and in toothache arising from inflammation, we are particularly induced to give them a full trial, from our knowing that the disease is not apt to return, after being once removed. But, when other means do not succeed, we are under the necessity of advising the tooth to be extracted, the only remedy in such circumstances, on which we can depend. In extracting a firm tooth, I have already advised it to be done in a slow gradual manner, with a view to prevent it from breaking, and the jaw from suffering so much as it is apt to do when a tooth is forced quickly out. This caution, however, is more especially necessary in the extraction of teeth under the circumstances we are now considering ; for, when the pain originates from inflammation alone, without any part of the tooth being spoiled, the roots are always entire, and more firmly fixed than when the corona of a tooth is mostly consumed, and when the roots, therefore, are commonly in some degree decayed. And besides, when pain and inflammation are induced, as I have already remarked, by swelling or en-

largement of the fang, and which can never be previously discovered, if the tooth be turned quickly round it will for certain break ; and the swelled part of it being left behind, scarcely any advantage will be derived from the operation, while all the pain and distress which it usually excites will be severely felt by the patient.

On pulling a tooth that is not in any part carious, we are advised by some practitioners to replace it, and to tie it to the contiguous teeth, till it becomes firm. This I have done in different instances ; but I think it right to observe, that it often fails, owing, I presume, to the experiment being most frequently tried with teeth in a state of inflammation. I know that it often answers where no symptoms of inflammation have taken place ; but whenever the membrane surrounding the roots of teeth, or even when the contiguous parts only are much inflamed, it will seldom or never succeed, while, at the same time, the trial will always excite much pain and distress. It ought not, therefore, to be advised indiscriminately in every case, as has frequently been done.

§ 3. *Of Toothache arising from Affections of distant Parts.*

ALL the symptoms of toothache sometimes take place in one, two, or more teeth, where even with the most accurate examination we cannot discover the least appearance of disease ; where we are therefore certain that no part of them is carious, and even where it is obvious, that the disease does not originate from inflammation.

In such circumstances, as the patient is at first always unwilling to part with a tooth that appears to be sound, all the remedies usually employed in toothache are made use of ; such as blisters ; bloodletting with leeches ; the application of ardent spirits and strong

essential oils to the pained part ; and after being for some days tormented with these, with little or no advantage, the pulling of the tooth is recommended as a remedy that does not fail. Even this severe alternative is at last agreed to ; but unfortunately with no benefit. The tooth in which the pain seems to be most severe is first taken out ; but the contiguous teeth becoming soon pained in an equal degree, they are from time to time taken out, till at last I have known all the teeth of one side of a jaw extracted, and still the pain continue equally severe in the gums as at first.

In such circumstances, we often find, that the pain in the tooth is induced by an affection of some other part, and that no remedy will answer that is not directed to the original disease. It originates in some instances from rheumatism ; it has been known to proceed from an arthritic diathesis ; it occurs as a frequent symptom in hysterical affections ; pregnant women are frequently distressed with it ; and in some cases it obviously proceeds from a foul state of the stomach.

When the pain originates from a foul stomach, which may be often known by the state of the tongue, as well as other circumstances, no remedy proves so useful as an emetic. I have known the most violent toothache, which for many weeks had resisted the effects of every other remedy, almost instantaneously removed by an emetic ; and when the stomach is sufficiently cleared, a plentiful exhibition of Peruvian bark will often prevent a return of it ; particularly where the fits of toothache have returned periodically, as they sometimes do so regularly as to give cause to imagine that they depend on a tendency to ague.

In this variety of toothache, arising from an affection of the stomach, no benefit is derived from laudanum. Instead of procuring ease, it seems rather to increase the pain, and, by inducing sickness, to render the patient in every respect worse. But in those varieties of the disease, which originate from rheumatism, gout, or hysterical affections, opiates will for the most

part remove the pain entirely : and a return of it may be frequently prevented merely by keeping the parts sufficiently warm. In hysterical patients, a combination of laudanum with æther has sometimes proved useful, when opiates in every other form have failed.

Opiates are often used in toothache induced by pregnancy ; but seldom with advantage. In large doses indeed they sometimes procure a short relief from pain ; but nothing I have tried answers with such certainty as bloodletting. A plentiful discharge of blood, by the application of leeches to the neighbouring gums, will sometimes answer the purpose ; but as the pain seems here to originate from a general plethoric state of the system, it commonly proves more effectual to empty the vessels by taking away ten or twelve ounces of blood from the arm. I have known women immediately relieved by bloodletting, who for several weeks had been liable to very violent degrees of toothache, and in whom neither tooth-drawing, opiates, blisters, nor any other remedy, were productive of any advantage.

When a practitioner finds that he has pulled a tooth in the circumstances we are now describing, where there is neither inflammation nor much caries, he may with much propriety replace it. After clearing the tooth and socket entirely of blood, it should be put as nearly as possible into its natural situation ; where it should be tied to the two contiguous teeth till it becomes firm.

SECTION X.

Of Transplanting Teeth.

THE advantages of a sound set of teeth, both with respect to beauty and utility, are evidently great : we are not therefore surprised at finding the fertile ge-

nus of modern artists employed in endeavouring to supply the loss of those teeth which accident or disease may have occasioned. The method of supplying these deficiencies, and even of making complete sets of teeth, has been long known, and the art has long been carried to great perfection; but the transplanting of human teeth from one living body to another is the invention of modern artists. The mere proposal of such a nice operation was entitled to much credit; and in no instance does the art of surgery appear to more advantage than in rendering the practice of it perfect. It will readily be conceived, however, that it is not admissible in every case. Various circumstances must concur to render it practicable; but it may commonly be done wherever it is necessary.

1. As it is in general more with a view to obviate deformity, than to be productive of any real advantage, that the transplanting of teeth is practised, it is seldom considered as necessary with any of the large molares. Indeed with these it could not often take place; for as the roots of them often diverge in a very uncertain manner, and as the number and length of the roots can never be previously determined, it would for the most part be impossible to procure teeth exactly fitted to the vacancies intended to be filled up. The practice is therefore confined almost entirely to the incisores and canine teeth, although it may be done with nearly an equal certainty in the small molares; for in them the roots are either single, or if there are two fangs they are almost always united.

2. In order to ensure success, the alveoli and gums must be perfectly sound. They must be free from scurvy and the lues venerea; nor must the patient undergo this operation for a considerable time after a salivation. The use even of a small quantity of mercury frequently leaves such a soft spongy state of the gums, as renders it improper while it continues to attempt any operation upon them. Hence those who are to have teeth transplanted, should carefully avoid

even the risk of contracting any complaint for the cure of which mercury may be necessary.* A patient being liable to gum boils has been considered as an objection to this operation ; but where every other circumstance concurs to render it proper, it should not be forbid by this : for although it would not probably succeed where the surrounding socket is carious ; yet we know that gum boils often occur where the socket is not in any respect diseased.

3. As the success of the operation will depend in a great measure not only on a sound state of the alveoli, but on the sockets being full and complete, it will seldom answer where teeth have remained long in the state of stumps : for in this state the roots commonly waste away so as to lose much both of their length and thickness ; and the alveoli diminishing in nearly the same proportion, sufficient space would not be left for fixing the roots of a sound tooth. The attempt, however, may be always made, where any considerable part of the corona of a tooth is left ; for in this case the roots, as I have formerly remarked, are usually complete, however much the caries may in other respects have spread.

4. It is in youth and middle age only that this operation is admissible. In childhood and old age it should not be attempted. In childhood, a tooth put in, in this manner, would never become firm, as the approaching tooth of the second set would always be acting against it ; and besides, as any vacancy produced at this period will be filled up when the second set comes forward, it can never be requisite. In old age again, two strong objections occur to it. At this period the sockets of the teeth are commonly much diminished, particularly in depth ; and many of the smaller blood vessels being now obliterated, it is not probable that any transplanted tooth would ever

* This caution is particularly inculcated by the late very ingenious Mr. John Hunter, in his *Treatise on the Diseases of the Teeth*, page 98.

become firm : for, when the operation succeeds, as a firm union always takes place between the tooth and contiguous parts by means of blood vessels passing from one to the other, we are led to imagine that it would not otherwise answer. Now this, for the reason that I have mentioned, can never happen in advanced periods of life.

5. The transplanted tooth ought to fit the socket as exactly as possible : but it should not require much force to insert it ; for if in any degree too large, either in length or thickness, it will create much unnecessary pain ; the irritation produced by it will probably terminate in suppuration ; and in this manner the operation will be rendered abortive. Several people therefore should be provided for the purpose of furnishing teeth ; so that the operator may have no difficulty in finding one of a proper size : it will frequently happen, that a tooth of the same size taken from one person, will fit the socket of the same tooth in another person very exactly ; but when it is found, that the roots of the tooth newly pulled are either too long or too thick for the socket in which they are to be placed, they should be filed down till they go easily in ; for it is not found that the removal of a small part of the root prevents the success of the operation ; and care should be taken to make the surface of the transplanted tooth somewhat lower than the level of the contiguous teeth, so that no inconvenience may ensue from the tooth in the opposite jaw being pressed against it. This difference in length, however, need not be so considerable as to be very perceptible ; for the smallest difference will answer the purpose, and a greater degree of it would produce deformity.

But although the roots of teeth to be transplanted may be lessened with a file, no part of the corona should be touched or injured. It is sometimes indeed done by dentists, and it may in some instances succeed ; but as it must always be attended with some risk of the tooth becoming carious, it should never be

advised ; especially as with due attention, it can never be necessary ; for although we may be mistaken with respect to the size of the roots of a tooth, we have it always in our power to determine with accuracy, whether the upper part of the tooth to be pulled will fit the vacancy or not.

6. In taking out the new tooth and removing the old one, much care and attention is necessary ; for if the new tooth is much broken, or if the socket in which it is to be placed is much injured, the operation will not succeed. When it is possible therefore to take out the old tooth with the forceps, it is better to do it in this manner than with the key instrument, which can scarcely be used without injuring the parts too much.

7. When the tooth is removed, the socket cleared of blood, and the new tooth inserted under the restrictions I have mentioned, we are next to endeavour to keep it firmly fixed till an adhesion sufficient for retaining it takes place between it and the neighbouring parts. This must be done by tying it to the two contiguous teeth, and by much attention on the part of the patient to do nothing to loosen it. In transplanting a canine tooth, the ligature, which should be made of several plies of fine silk properly waxed, should be first tied round the upper part of the new tooth, immediately above where it begins to swell ; and on the tooth being properly placed, it should be tied to the two contiguous teeth, taking care to pass the ligature as near as possible to the gums. But when an incisor or small molaris is transplanted, it answers better to fix the ligature first to the contiguous tooth near to the junction of the gums, and then to pass it over the surface of the new tooth, and bringing it again back, to fix it where it commenced, round the necks of the other teeth. In this manner the transplanted tooth is pulled down by the ligature into the socket ; but much care is necessary to prevent it from being drawn too much either to one side or

another ; for nothing more certainly prevents our success than the new tooth being made to press upon either of the contiguous teeth. This, however, will never happen in the hands of an expert artist, who has been sufficiently accustomed to this branch of practice ; nor can it happen with any who is duly warned of the consequences that may ensue from it.

When the ligatures are properly fixed, they may not perhaps need to be renewed ; but when they either slip off accidentally, or become loose, they should immediately be renewed ; and the patient should be constantly on his guard to avoid whatever might in any degree loosen or shake the tooth. Nor is it sufficient to attend to this for a few days only : the same kind of caution must be continued till the tooth becomes firm ; and the length of time necessary for this will depend on the circumstances of every case ; on the particular state of the alveoli ; on the age and habit of body of the patient ; and on the operation being done with more or less accuracy : in some cases a tooth will become perfectly firm in the space of eight or ten days ; while in others it will remain somewhat loose for two or three months. During all this period the patient should live as much as possible on spoon meat, and should guard particularly against cold ; for nothing renders the success of the operation more uncertain than exposure to cold or dampness.

The most important objection that has been started to the transplanting of teeth, is the risk with which it is attended of communicating diseases ; and I must own that *a priori* it appears to be a very material one. It has not however been found on experience to be sufficient to counterbalance the advantages that individuals suppose they derive from it ; for the operation is daily practised ; and we seldom hear even of any suspicion of its having carried infection into the system. I am not, however, of opinion with those who think that diseases cannot be communicated in this manner. On the contrary, I think those practi-

tioners do not deserve to be employed, who treat a matter of such importance to their patients with indifference. Teeth for the purpose of transplanting should never be taken from people with any appearance of disease. Those only should be used that are procured from constitutions in which there is every possible evidence of health ; and with a view to prevent as much as it can be done, every risk of infection being conveyed, the tooth to be transplanted should be immersed for a few seconds in lukewarm water, and should afterwards be entirely cleared of any blood or matter that may adhere to it, by rubbing it between the plies of a piece of soft old linen.

There is reason indeed to imagine, from the result of some experiments made with a view to inoculate the measles, as well as some other diseases, with the blood of those infected with the disease, that infection cannot be communicated in this manner. But the point is by no means so certain as to warrant our placing much dependence upon it.

SECTION XI.

Of the Ranula.

TUMORS of different degrees of consistence frequently form beneath the tongue, sometimes on one side, and at others on both sides, of the frenum ; and in general they are distinguished by the term ranula. They seldom give much pain ; but in some instances they become large, so as even to impede the sucking of infants, and the mastication, and speech of adults. In such circumstances, the assistance of surgery becomes necessary.

In some cases, these tumors contain a fatty kind of matter : this however is rare ; and for the most part, perhaps in nineteen cases of twenty, they are filled almost entirely with a thin limpid liquor, very much resembling saliva ; and we find, on cutting into them, that they are often produced by a stoppage of the salivary ducts, the effect of calculous concretions. They sometimes arrive at a large size ; but in general the tumor bursts when of the size of a large nut, leaving an ulcer that proves difficult to heal, if the real cause of it is not discovered and removed. I have known this kind of ulcer treated with much attention for the space of several months, various detergent and even corrosive applications employed for it, nay, in one instance a long mercurial course was administered, but with no advantage whatever ; and, at last, on the true origin of the disease being discovered, it was cured in the space of a few days, merely by removing a portion of hard calcareous matter, which, by stopping the natural passage of the saliva, first produced the tumor, and afterwards prevented the ulcer, in which it terminated, from healing. In some instances these concretions are small, not larger perhaps than the head of a middle sized pin ; whilst in others they are large. I have in different instances found them of the size of a kidney bean.

In all cases where the tumor is soft, our best practice is to lay it open with a scalpel from one end to the other ; by which any calcareous particles contained in it are easily discovered ; and these being removed, the remaining sore commonly heals easily. There is no necessity, however, for washing the sore, as we are generally advised to do, with tincture of bark and other astringents : on the contrary, warm water and other emollients answer better, by washing out more effectually any particles of stone that may not have been previously discovered. When indeed the sore proves afterwards difficult to heal, the others may sometimes be employed with advantage.

The same kind of treatment should be pursued in the treatment of old fistulous sores of these parts. In almost every case where the disease is seated in any of the salivary glands or ducts, it will appear to be kept up by the cause I have mentioned, namely, a stoppage of the duct by a particle of stone ; and the removal of this, by an incision, and turning it out with a probe or a scoop, will very commonly answer.

When, again, tumors in this situation are of a fatty or even of a firmer consistence, instead of cutting into them, they should be extirpated entirely ; and unless they lie deep, and are of a large size, it may always be done with safety.

Practitioners are very properly indeed afraid of hemorrhagies in this situation ; for as the arteries lie deep, it is always difficult, and most frequently impossible, to secure such of them with ligatures as happen to be cut. But wherever the tumor is loose, and not deeply attached to the contiguous parts, it may be taken out without any risk of hemorrhagies ; for the superficial arteries being small, any discharge which they produce, in general, stops, by the application of oil of vitriol, duly diluted ; alcohol ; or tincture of myrrh. In more violent hemorrhagies, the potential or even actual cautery should be employed ; but means of this kind are seldom necessary.

In the removal of these tumors, where they lie so deep that they cannot be easily laid hold of with the fingers, small forceps are usually employed ; but a small hook with two fangs, such as is represented in Plate XXXVII. fig. 3. answers better.

SECTION XII.

Of Ulcers of the Mouth and Tongue, and Extirpation of the Tongue.

THE tongue and other parts within the mouth are liable to all the variety of ulcers incident to other parts of the body; and the means of cure that are employed for them should be nearly similar. When they seem to proceed from lues venerea, scrofula, or scurvy, our views should be chiefly directed to the cure of the general disease of the system, while local remedies only should be employed, when they appear to be local.

Besides other causes of ulcers, however, to which these parts are liable, it is proper to observe, that there is one to which they are more particularly exposed, and which appears to give rise to the greatest part of them, namely, ragged teeth. I have known very troublesome sores, not only produced, but kept up for a great length of time, on the sides of the tongue, and on the insides of the cheeks, by the sharp points of broken or carious teeth; and as long as the rough part of a tooth, which has once induced a sore of this kind, is allowed to remain, no remedy whatever will heal the sore. In every case, therefore, of ulcer in the mouth, we should inquire with much attention into the state of the contiguous teeth; and when any of them are rough and pointed, they should be made as smooth as possible with one of the small files, Plate L. fig. 5. or 6. Or when the sore appears to be induced by tartar upon the teeth, it should be removed in the manner I have already advised in the eighth section of this chapter.

The removal of the cause is for the most part soon followed by a cure of the sore, but when this fails, we frequently derive advantage from washing the mouth

with gargles composed of decoctions of bark ; a solution of alum ; lime water ; infusions of red rose leaves ; of oak bark ; and other astringents.

In some cases, however, the sores become worse, notwithstanding the use of these, mercury, and every other remedy. They become ragged and unequal about the edges ; they discharge a thin, fetid sanies ; and in this state are commonly attended with much pain.

As long as the sore remains small, and does not shew any tendency to spread, there is in general cause to hope that a cure may be obtained ; but whenever it has assumed the appearances I have enumerated, and when it does not yield to any of the means I have mentioned, as there will be little or no cause to doubt of its being cancerous, we should advise it without further delay to be cut out.

A cancerous sore, whether seated on the tongue, or on the inside of the cheek, if it does not run deep, may be extirpated with ease and safety ; but when the substance either of the cheek or of the tongue is much affected, it becomes an object of more importance, as being attended both with difficulty and hazard. Whatever the risk may be, however, if the diseased parts can be all removed, the operation should certainly be advised : for as we know of no other remedy upon which any dependence can be placed for the cure of cancer, it is surely better to submit to some risk than be left to certain misery and death.

When a deep seated cancer in the cheek is to be removed, the easiest and most effectual method of doing it is to make an incision through the whole substance of the cheek, commencing at the contiguous angle of the mouth, and ending at the same point, after surrounding the sore : the diseased parts being removed, the sides of the cut should be laid neatly together ; and a number of gold pins being introduced at proper distances along the course of it, a cure will be completed by the twisted suture, in the manner de-

scribed in Section I. of this Chapter. In this way very extensive cancerous fores may be removed without leaving much deformity ; while a very disagreeable unseemly cicatrix is always left after the usual method of doing this operation, by removing the diseased parts only, and allowing them to heal without drawing them together with futures.

In removing any considerable part of the tongue with the scalpel, as the hemorrhagy that ensues is the only symptom of hazard, the operator should be previously provided with all the ordinary means of putting a stop to it. When ligatures can be passed round the divided arteries, no other remedy should be trusted ; and this, I may remark, may be done more frequently, and at a greater depth in the mouth, than is commonly imagined. As the tongue can be pushed a considerable way out of the mouth, ligatures may be applied to wounded arteries, even when much of it has been taken away, merely with the common tenaculum or crooked needles ; but when this does not answer, it may sometimes be done in the manner I have described in Section V. Chapter X. for the removal of schirrous tonsils. A ligature being passed round the artery with the needle used in fig. 3. Plate XXXVIII. it may then be tightly twisted by passing the two ends of it through the double canula, fig. 1. Plate XXXI. or a knot may be formed upon it with the instrument, fig. 2. Plate XXXVIII.

When, however, the artery cannot be surrounded with a ligature, we must endeavour in some other manner to put a stop to the hemorrhagy. If the vessel is not large, keeping the mouth filled with astringent gargles, either of alcohol, a strong solution of alum, distilled vinegar, or water strongly impregnated with the vitriolic acid, will often answer : but when these do not succeed, the potential, or even the actual cautery, must be employed as the last resource.

The removal of any considerable part of the tongue, I must allow to be a very formidable operation : as

such it has been always considered ; and accordingly it has been rarely practised. But, for the reasons that I have mentioned, I have no hesitation to say, that it is sometimes necessary, and in general that it may be done with safety. It ought not, however, to be attempted by every operator ; for as it is always attended with a sudden discharge of blood, the application of means proper for the stoppage of this, obviating the effects of fainting, and other unexpected difficulties, that sometimes occur, require that steady, deliberate coolness, which a natural firmness of nerves, conjoined with much experience, alone can give.

SECTION XIII.

Of the Division of the Frænum Linguae.

WE sometimes find in children at birth, that the tongue is too closely tied down at the bottom of the mouth, owing to the frænum being either too short, or continued too near to the point of it. The method of cure is obvious : this membrane or ligament must be divided so as to allow the tongue to have free motion ; and it should be done as soon as it is observed to be necessary, otherwise the suckling of the child may in the first place be impeded, and afterwards an interruption to speech may arise from it.

It is proper however, to observe, that it is not a frequent occurrence ; for although nurses often speak of children being tongue tacked, that either do not suck readily, or that are backward in speaking, yet all practitioners will allow that they seldom meet with it.

The division of this membrane is an easy operation ; but it must be done with attention, otherwise the contiguous blood vessels might be injured, by which such a quantity of blood might be lost as an infant could not easily bear : it is commonly done ei-

ther with a scalpel or common scissars ; but it may be performed both with more ease and safety with the instrument, fig. 3. Plate XLIX. The child being laid across the nurse's knees, the surgeon should open the mouth, and elevate the tongue with the index and middle finger of his left hand, while with the other he must introduce the instrument, so as to receive the middle of the frænum into the slit, which he may now divide with safety to any necessary depth.

SECTION XIV.

Of the Divisions of the Parotid Duct.

THE parotid gland of each side transmits the liquor which it secretes by a duct of the size of a crow's quill, which, after passing over part of the masseter muscle, penetrates the buccinator in an oblique direction, and empties itself into the mouth about the middle of the cheek.

In the operation described in Section XII. of this Chapter, that of extirpating cancerous fores from the cheek, as well as by various accidents, this duct is apt to be cut ; and if the two divided ends of it be not retained together till they heal, the whole quantity of liquor which it ought to convey to the mouth is poured over the cheek ; and the discharge being constantly kept up, the sore is thus prevented from healing, and a fistulous opening produced, corresponding to the size of the duct. As the sore commonly heals internally, the discharge would necessarily continue during life, if means were not used for preventing it.

In recent divisions of this duct, the best practice is to lay the two ends of it exactly together, and to re-

tain them in this situation till they unite ; by adhesive plasters, when this proves sufficient ; or by the twisted future, when the retraction of the divided muscle is considerable : but when this has either been neglected at first, or fails of success, as the distant extremity of the duct soon heals, and is entirely obliterated at the divided end of it, owing to none of the fluid secreted by the gland passing through it, the only way in which a cure can be obtained is to make an artificial opening into the mouth, and endeavour to form an union between it and the upper part of the duct leading from the gland.

In making this passage, it ought to be carried as nearly as possible in the direction of the natural duct ; but in order to ensure success, it should be rather of a larger diameter than the duct. For this purpose, a sharp pointed perforator of a proper size should be entered on the other side of the fore, exactly opposite and contiguous to the under extremity of the superior part of the duct ; and being carried with some degree of obliquity, it must in this manner be made to penetrate the mouth. This being done, a piece of leaden probe, nearly the size of the perforator, should be introduced along the course of the newly formed opening, and retained in it till the sides of it become callous ; when, the lead being withdrawn, the end of the duct should be drawn into contact with the superior part of the artificial opening by means of a piece of adhesive plaster, and kept in this situation till a firm union has taken place. After taking out the lead, we have it in our power to forward the cure, by rendering the end of the duct and of the newly formed opening raw with the edge of a lancet or scalpel, before bringing them together. Till a firm adhesion takes place between them, the patient should be directed to live upon spoon meat ; to speak little or none ; and to make as little exertion with his jaws as possible.

In this manner, fores, which would otherwise continue to discharge saliva for life, may be easily healed, with scarcely any mark of their having ever existed ; of which I have now had several instances, in all of which complete cures were obtained.

A common seton or cord of cotton has been recommended for this operation instead of lead ; and a bit of catgut has been used instead of it : but nothing renders the parts so quickly callous as lead ; and besides, it is more cleanly than a cord or tent of any softer substance.

CHAPTER XV.

OF THE DISEASES OF THE EARS, AND OPERATIONS
PRACTISED UPON THEM.

SECTION I.

Of Deafness.

DEAFNESS may proceed from various causes; for, as a free passage of sound to the tympanum or drum of the ear, together with a sound state of this membrane and of the parts connected with it, are requisite for the sense of hearing, so whatever tends to obstruct the one, or to induce diseases of the other, will necessarily excite deafness.

Two passages are appropriated for the purpose of conveying sound to the ear; one of them termed the meatus externus, terminating in the external ear; and the other the tuba eustachiana, ending in the throat. It is true, that the first of these is of more importance than the other, for it is larger, and more conveniently placed for collecting sound; but it is certain, that the latter or internal passage is a very necessary part of the organ of hearing; for when by any means it is stopped, deafness, to a greater or less degree, almost constantly ensues. Thus we observe, that any preternatural fulness or enlargement of the amygdalæ, especially when they are attacked with inflammation, is always attended with some degree of deafness. In this way, too, we account for that deafness to which patients are liable who have suffered much from venereal ulcers in the throat: and polypous excrescences that extend back from the nose and fauces, by com-

pressing the eustachian tube, are frequently productive of similar consequences.

In that variety of deafness which originates from this cause, a removal of the polypus, or swelled amygdalæ, will frequently accomplish a cure, while no other remedy can be of any avail. But when it is induced either by an ulcerated state of these parts, or by much inflammation, as the extremity of the duct will probably be obliterated, it would be in vain to employ any means of cure. It has indeed been proposed in this variety of obstruction, to endeavour to open the duct, by inserting the end of a curved blunt probe into it, or even to inject milk and water, or any other mild fluid, into it, with a curved syringe. But although a person well acquainted with the anatomy of the parts, may, by much practice, arrive at such perfection as to be able to do this with little difficulty upon a dead body, there is no reason to imagine that in practice any advantage will ever be derived from it: for even in a healthy state of these parts, the irritation which the end of a probe or of a syringe serves to excite on being made to touch them, must be so considerable as to render every attempt for inserting them very uncertain; and the difficulty must necessarily be increased where the extremity of the duct is obstructed by disease. But if we have not much in our power in the treatment of deafness arising from this cause, we are in many instances able to afford much relief, and even to restore the most perfect hearing where it has been entirely wanting, when the disease arises from obstruction in the external passage of the ear.

The meatus externus may be obstructed in various ways. It may be in an imperforated state at birth; it may be more or less filled with extraneous bodies forced into it; tumors or excrescences may form in it; and it may be too much stuffed with wax, the natural secretion of the part. As each of these causes

requires a method of treatment peculiar to itself, I shall consider them under separate heads.

§ 1. *Of an Imperforated Meatus Auditorius.*

AMONG other natural deficiencies to which the human body is liable, none occurs more frequently than an imperforated state of some of the passages. This does not so frequently happen in the meatus auditorius as in others, owing perhaps to the lining membrane of this passage being every where attached to bone, by which it is prevented from collapsing. Notwithstanding, however, of this, different instances have occurred of it, and some variety is discovered in the nature of it.

In some cases the obstruction is formed by a thin membrane spread over the extremity of the passage; while in others a considerable part of the conduit is entirely filled with a firm fleshy kind of substance.

In the treatment of this variety of deafness, nothing can prove useful but the removal of the cause by an operation. When this is to be done, the patient's head should be secured in a proper light, and at a convenient height, by an assistant; when the operator, with a small sharp pointed bistoury, should make an incision of a proper length exactly on the spot where the external passage of the ear should terminate. When covered by a membrane only, the operation will soon be finished; but when impervious to any great depth, the incision must be continued, by passing the bistoury in a gradual manner farther in, either till the resistance is removed, or till there is reason to fear that the tympanum would be hurt, if it were carried deeper; in which case the instrument should be withdrawn; and in order to prevent the parts from adhering together, a bit of bougie properly oiled should be introduced, and retained till the cure is finished; care being taken to remove it daily for the purpose of cleaning it, and for wiping off any matter that may have collected in the ear.

In this manner deafness depending upon this cause may often be removed when the obstruction lies between the tympanum and the farther extremity of the meatus externus; and it should be always attempted about the time when the child should be beginning to speak. At a more early period, the child would not be so able to bear it; and when delayed much later, it would impede his speech; for we know that dumbness depends more frequently on a want of hearing than on any other cause.

§ 2. *Of Extraneous Bodies impacted in the Ear.*

ALTHOUGH the viscid nature of the wax of the ears is well calculated for preventing dust and other foreign matters from passing into them, yet we know that much distress is in some instances induced by this cause. Children often push small peas, cherry-stones, lead drops, and other such articles into their ears, and flies and other insects frequently creep into them.

When these lie near to the end of the passages, flies and other things that can be laid hold of should be extracted with small forceps, such as are delineated in Plate XLVIII. fig. 2. But peas and other round bodies are more easily removed, by turning them out with the end of a curved probe, or passing the end of the instrument Plate XXV. fig. 1. behind them; and their extraction is facilitated by a little oil being previously dropped into the passage.

When insects have got so far into the ear that they cannot be taken out with forceps, the best method of removing them is to wash them out, by throwing in quantities of warm water, or any other mild liquid, with a syringe; but as they adhere while living with considerable firmness to the neighbouring parts, we should first endeavour to kill them, by filling the ear with oil, or any other liquid that proves poisonous to them without injuring the tympanum. Lime water, spirit of wine, and other liquids, might be employed

for this purpose: but nothing proves so harmless as oil; and although it does not kill every species of insect instantaneously, yet few of them live if immersed in it for any length of time. The patient should therefore be desired to rest his head on the opposite side; and some tepid oil being poured into the ear, it may thus be easily kept in it as long as is necessary.

Peas and other soft bodies that swell with moisture, are apt to become so large when they remain long in the ear, that they cannot but with much difficulty be extracted entire. In this case we should endeavour to break them, either with the points of small forceps, or with a sharp small hook cautiously introduced along the passage; and as soon as they are sufficiently divided, they must either be taken out piece-meal with forceps, or washed out with a syringe.

§ 3. *Of Excrescences in the Meatus Auditorius.*

I HAVE already treated of polypi in the nose and throat; and I may now remark, that the external passage of the ear is equally exposed to them. It is not indeed common for this kind of excrescence in the ear to arrive at such a bulk as they do in the nose; but whoever has paid attention to this branch of practice, will acknowledge, that they are by no means unfrequent, and they often appear to be the cause of very obstinate deafness.

On looking into the meatus auditorius, we sometimes find it filled with a polypous excrescence hanging loose by one pedicle; while at other times the passage appears to be obstructed merely by a thickness or fulness of the lining membrane of the ear, when no particular part of it is more diseased than another.

As polypi of this part are usually of a firmer texture than polypi in the nose, and as the membrane of the ear is firm, and does not readily yield, they cannot easily be extracted with forceps; but they may be taken out either with the knife, or with a ligature.

When they lie near to the entrance of the external passage of the ear, and can be laid hold of either with small forceps, or with the dissecting hook, Plate XXXVIII. fig. 3. they may be cut out with the probe pointed bistoury, represented in Plate XXXIX. fig. 3. and as they do not appear to be so vascular, as similar excrescences in the nose, they may in this manner be removed with safety; for they seldom discharge much blood. But when they lie deep, it is better to remove them with ligatures; for as the passage is strait, a knife is in this situation introduced with difficulty, and used with uncertainty.

Various methods have been proposed for applying ligatures to excrescences in this situation; but the method of removing polypi of the nose, described in the explanation of Plate XXXIII. appears to be the best. With the forked probe, fig. 2. the doubling of a ligature may be pushed up at one side of the polypus till it reaches the root of it; and the two ends of the thread being carried round the excrescence, and inserted into a short double canula, such as is delineated in Plate XXXI. fig. 1. the canula should then be pushed to the root of the polypus on the opposite side; when the two ends of the ligature being drawn sufficiently tight, and fixed upon the knobs at the end of the tube, the probe may be withdrawn, and the polypus will drop off in a day or two.

But it often happens, that these excrescences cannot be removed in this manner; for instead of being pendulous by a small neck, they frequently extend to a considerable depth along the lining membrane of the ear. In this case escharotics have been recommended: but as they cannot be employed but with much risk of hurting the tympanum, they should never be used; and this especially, as the disease may in general be removed by means of a more simple nature. This affection of the membrane of the ear I consider to be exactly similar to that variety of obstruction in the urethra in which bougies prove parti-

cularly useful ; and the same remedy, when duly persisted in, proves equally serviceable in the one disease as in the other. In the introduction of the bougie, care must be taken not to pass it to the depth of the tympanum, otherwise it may do more harm than good ; and the size of it must from time to time be enlarged till the passage becomes sufficiently open.

When bougies are first passed into the ear, they always create some degree of uneasiness, by irritating the parts to which they are applied ; but this soon subsides when they are used with caution, and properly oiled before being introduced.

§ 4. *Of Deafness from Wax collected in the Ears.*

WHETHER it is from the lining membrane of the ear being possessed of some degree of a contractile power, or from the outward extremity of the passage being somewhat lower than the other, that the cerumen or wax does not usually lodge in it, is perhaps difficult to determine ; but it is certain, that in a healthy state of these parts they are usually very thinly covered with this secretion : deafness in a certain degree is very commonly induced by the passage of the ear being stuffed with wax ; for in this state it very effectually obstructs the passage of sound to the tympanum. It commonly happens too when wax remains long collected in the ear, that it becomes thick, and even hard, insomuch that in some instances it becomes almost as firm as a bit of timber.

The treatment of deafness arising from this cause is obvious. By an attentive examination of the ear, we can distinguish with certainty whether there is a superabundance of wax or not : for by placing the ear in a clear sunshine, we can see even to the tympanum ; and whenever the passage is much obstructed with wax, we should not hesitate in advising it to be removed.

Different methods have been proposed for clearing the ears of wax ; but the safest and easiest is to wash

or syringe them with warm water or any other mild liquid. Milk and water, or soap and water, answer the purpose : but before the operation a few drops of oil should be poured into the ear, not with a view to dissolve the wax, for more powerful solvents of this substance might be mentioned ; but for the purpose of lubricating the passage, by which the wax is more easily forced out. By a proper use of the syringe, which experience alone can teach, the ears may be entirely cleared of every obstruction produced by wax.

Although obstruction of the external passage of the ear is the most frequent cause of deafness ; yet in some instances it is produced in a different manner. It may occur from a morbid state of the tympanum, and of the parts contained within it. To a certain degree it will take place, if either by accident or disease the external parts of the ear are destroyed ; and it sometimes occurs from a deficiency of wax.

The small bones of the ears sometimes become diseased in scrofula, and the deafness that ensues from this is never in any instance removed. In such cases all that art can do, is to preserve the parts clean and free from sinell, which is most effectually done by washing out evening and morning any matter that happens to collect in the passage, by throwing in warm milk and water with a syringe : for if this be not done, the matter discharged from the carious bones soon becomes offensive ; and it continues to be so, either till the diseased parts of the bones are entirely dissolved and discharged, or perhaps during the life of the patient.

We ought not, however, to confound this disease with a discharge that frequently takes place from the ears, of a milder nature. In some cases this appears to be the consequence of a boil or abscess in the meatus externus ; while in others it takes place without any previous imposthume, and seems to be induced by some slight inflammation of the lining membrane of the ear, or perhaps of the tympanum itself.

This is a common occurrence, and for the most part I think it is not properly treated. In general, it is supposed to proceed from morbid humours in the system; so that some risk is supposed to attend any attempt that may be made for putting a stop to it.

This, however, is wrong. In most instances the discharge may be traced to the cause I have mentioned, inflammation of the membrane of the ear; which being of a local nature, no risk can ensue from checking it. And accordingly, in cases of this kind, I commonly advise injections, such as prove most useful in gonorrhœa. A weak solution of alum, or of saccharum saturni, frequently answers, or French brandy somewhat diluted. In some cases, pouring a few drops of any of these into the ears, morning and evening, proves sufficient; but when this fails, they should be gently thrown in with a syringe.

It is proper here to remark, that the more early in the disease this practice is employed, the more effectual it usually proves; so that it should never be long delayed. And besides, when the discharge has been of long duration, it not only does harm by relaxing or even destroying the tympanum, but some risk may thereafter arise from a sudden stop being put to an evacuation to which the system has for some time been accustomed. The danger, however, may be obviated by the previous introduction of an issue somewhat adequate to the discharge from the ear, either in the head, neck, or any other part; but in recent cases there is no necessity for putting the patient to the inconvenience of an issue; for here the discharge may with safety be stopped immediately.

When deafness takes place, either from relaxation of the tympanum, or from any deficiency in the external parts of the ear, some assistance may be derived from our endeavouring to collect or concentrate sound so as to make a stronger impression on the organ of hearing. Various instruments have been invented for this; but none of them answers so well as one nearly

of the form of a common horn, such as is represented in Plate I. II. fig. 2. Figure 1. is a convoluted tube employed for the same purpose ; and fig. 3. represents an instrument intended to be concealed beneath the hair or wig, and to be fixed to the head by the two strings connected with it.

When, again, a deficiency of wax is suspected to be the cause of deafness, dropping a little oil of almonds, or any other mild oil into the ear, once or twice daily, proves sometimes useful. In some cases I have known benefit derived from a little soft soap being inserted into the passage ; which not only keeps it moist, but by acting as a stimulus to the lining membrane of the ear, it tends thus to induce a return of the secretion of wax. With the same view too, I have sometimes employed strained galbanum made into a proper consistence with oil, along with a small proportion of the juice of an onion.

SECTION II.

Of Perforating the Lobes of the Ears.

BY medical writers of the 17th and preceding centuries, piercing the lobes of the ears is recommended as an operation that may prove useful in different diseases, particularly in affections of the head. In those times a small seton was drawn through the opening, with a view to induce a discharge of matter, which in some cases might prove useful. At present this operation is never employed but for the purpose of ornament.

This is perhaps the most simple of all operations ; but as it is supposed to be of some importance by those on whom it is practised, it is necessary to describe it. As heavy ear rings are apt to tear the parts, the opening should be made as high on the lobe as with pro-

priety it can be done ; and the spot should be previously marked with ink. The patient being seated, and the head secured by an assistant, the lobe of the ear should be stretched upon a piece of cork placed beneath it. The surgeon is now to pierce it with the instrument, fig. 6. Plate LII. and having pushed it so far through that the tubular part of it is freely perceived on the opposite side, the cork must be withdrawn with the perforator stuck into it. A small piece of lead wire is now to be inserted in the tube remaining in the ear ; and on being drawn into the perforation, the lead must be left in it. By moving it daily, which may be done with little or no pain if it is previously rubbed with oil, the passage will soon become callous, and thus the operation is finished.

Before concluding the chapter on the diseases and operations on the ears, it may be expected that I should describe the method of cauterising or burning behind the ears for the toothache. At one period this operation was much employed, and different instruments were proposed for doing it. It is unnecessary, however, to delineate any of them ; for the practice is now, I presume, very generally laid aside ; and at any rate it may be done with a red hot probe of any kind equally well as with the neatest instrument. It was supposed to prove useful by burning or destroying the nerve producing the pain ; but it would rather appear to act by inducing terror or surprise ; and if this is the case, it is probable that the same operation would answer if practised in any other part. But as the pain attending it would by most people be considered as more severe even than the pulling of a tooth, it is not probable that it will ever be revived.

CHAPTER XVI.

OF THE WRY NECK.

THE neck is sometimes considerably bent to one side : when this takes place to such a degree as to produce much deformity, the assistance of surgery becomes necessary.

The wry neck may be produced in various ways. It may depend upon an original mal-conformation of the bones of the neck : on a præternatural degree of contraction in the muscles of one side of the neck, particularly of the sterno mastoideus muscle : or, it may be induced merely by a contraction of the skin, in consequence of extensive sores and burns.

When the vertebræ of the neck are distorted, it would be in vain to attempt any means of relief ; but either of the other causes I have mentioned seems to admit of almost a certain removal.

In books of surgery the operation for the wry neck is very commonly described ; and as this deformity has in general been imagined to proceed solely from a contracted state of the sterno mastoid muscle, a division of this muscle is usually proposed as the only means to be trusted. Even Mr. Sharpe was of this opinion ; and he delineates an instrument termed a probe razor for performing the operation.*

But were we even to admit that the division of this muscle was a necessary measure, the method of doing it by introducing the probe razor beneath it and dividing it afterwards, appears to be exceptionable, as being attended with much risk of wounding the contiguous blood vessels : it would surely be better to di-

* Vide Sharpe's Surgery, Chap. xxxv.

vide the muscle by repeated strokes of a scalpel, and to continue the incision in a gradual manner to such a depth as may be necessary ; by which even the large veins of the neck might be avoided. But although we allow that a wry neck may be sometimes produced by a contraction of this muscle, yet it appears to be a rare occurrence : I have now met with many instances of this deformity, and in all of them the contraction seemed to be in the skin alone.

When the skin only is affected, the parts are more easily divided and with less risk than when the deep seated muscles are to be cut ; but even this should be slowly done, so as to avoid the external jugular veins ; for although no great harm might ensue from their being cut, they should never be wounded unnecessarily. But whether the cause of contraction is seated in the sterno mastoid muscles, or in the skin, the incision should be carried so deep as to remove it entirely, otherwise little or no benefit will ensue from the operation.

We ought not, however, to conclude, that our object is accomplished on the contracted parts being divided ; for unless some method is employed to support the head during the cure of the sore, it will still be apt to incline more to this side than to the other, by which the parts newly divided will readily unite, so that no advantage will be derived from the incision. By Mr. Sharpe and others, we are indeed advised to stuff the sore with lint, so as to prevent this inconvenience with as much certainty as possible ; but I know from experience that this does not succeed, and that nothing will answer but a firm support being given to the head. For this purpose the instrument represented in Plate LIV. fig. 1. answers well : it was made for a case of this kind, in which it was used for several weeks, and with complete success. It should always be worn, not only till the sore is healed, but for some time thereafter ; and if properly fitted to the

parts upon which it rests, it is used with no uneasiness.

The skin beneath the chin is sometimes so much contracted in consequence of burns and other causes, as to draw the head considerably down upon the breast; the same method of cure must be practised for it that I have just recommended for the wry neck. The contracted skin must be freely divided with a scalpel, and the head properly supported from behind till the sore is cicatrised.

CHAPTER XVII.

OF BRONCHOTOMY.

WHEN respiration becomes much obstructed and endangers the life of the patient, and when this appears to proceed from a local affection of the superior part of the windpipe, an operation commonly termed bronchotomy is employed for relief. But as this consists in an opening made into the trachea, and not into the bronchiæ, it ought more properly to be named tracheotomy.

This operation has in general been supposed to be of a more dangerous nature than it really is ; and this has prevented practitioners from advising it so frequently as they otherwise would have done. By many, it is said to be seldom necessary ; and even some authors of eminence have asserted, “ that it is useful only in that species of angina, where the throat is exceedingly enlarged by the swelling of the thyroid gland and parts adjacent.” These are the words of Mr. Sharpe in his treatise on this subject.* But it is evident that in this instance Mr. Sharpe has written without full consideration ; for, although a swelling of the thyroid gland may become so large as entirely to compress the trachea, and may thus render bronchotomy necessary, yet this is surely a rare occurrence ; few practitioners have probably met with it ; and there are not many, I presume, who have not performed the operation on other accounts. The danger that once was supposed to attend it is not now dreaded, and accordingly it is more frequently advised ; but still there is reason to think, that it should be oftener practised than it has hitherto been.

* Operations in Surgery, Chap. xxxi.

The causes that may render bronchotomy necessary are :

1. Spasmodic affections of the muscles of the larynx, when they became so severe as to threaten suffocation : in some cases of catarrh, the mucus of these parts become so acrid, as to irritate the glottis in a most disagreeable manner. Even from this kind of irritation, it is evident from the sense of suffocation, which sometimes occurs, that much contraction is produced in the glottis : but this takes place in a more alarming degree, from hard substances of any kind passing below the epiglottis into the larynx ; insomuch that from this cause alone, suffocation has in various instances happened. Among others that might be recited, a remarkable history is recorded by Bonetus, of a child having died from a piece of bone passing into the trachea arteria ; and it has often happened, that children, and even older people, have been suffocated by nutshells, crusts of bread, and other substances passing into the trachea.

It has been alleged, that no alarming degree of contraction in the glottis can ever take place ; and it has even been said, that the muscles with which it is furnished are not adequate to this effect. This opinion, however, originates from the very relaxed state in which these muscles are found after death ; which is not by any means a fair method of judging ; for we know well, that all the muscles in the body are after death found in a state of relaxation, however severely they may previously have been contracted.

2. A piece of bone, flesh, or any other firm substance, being lodged in the pharynx, or in the upper part of the œsophagus, and too large to pass down to the stomach, may by its bulk compress the posterior and membranous part of the trachea in such a manner as to produce a total obstruction to the passage of air into the lungs. Different instances have occurred in this place of suffocation being induced by a piece of flesh lodging in the superior part of the pharynx ;

for in such instances, it commonly happens that patients are irrecoverably dead before any assistance can be procured. I have myself met with several instances of this, in all of which the utmost certainty was obtained of respiration having been obstructed for a few minutes only ; and yet none of the people recovered, although all the means usually employed in such cases were immediately put in practice. But in all there was reason to think that bronchotomy would have proved effectual, had it been possible to procure more speedy assistance.

The event of these cases, as well as of some others of drowned persons, in whom respiration had been obstructed for a very short period only, and in whom every method now known was put in practice for their recovery, makes me conclude, that few, if any, have ever recovered in whom respiration has been totally obstructed for more than a few minutes.

After all the attention that I have been able to give to cases of this kind, I would say, that complete interruption to breathing, for the space of five minutes only, must, in perhaps every instance, prove fatal. We have heard, indeed, of the recovery of many drowned people after they had been half an hour, nay even hours, under water ; but these accounts of the time which bodies have remained immersed are seldom accurately obtained, from the general inclination in bystanders to exaggerate, as well as from other causes ; so that little or no credit is in general due to them.

3. Polypous excrescences in the nose have been known to fall so far into the pharynx as to endanger suffocation ; and it very commonly happens, that these tumors, which originate either from the uvula or from the superior part of the pharynx, are attended with this effect ; in all of these, when extirpation with a ligature is to be attempted, if the tumor is large, it is with much difficulty that the necessary apparatus is

applied. This, however, may be much facilitated by a previous opening of the trachea, which admits of easy respiration while the ligature is forming round the base of the tumor.

4. Tumors that are firm, particularly those of the scirrhus and fleshy kinds, even when seated externally, have been known to compress the trachea so much as almost entirely to obstruct respiration : when so situated as to cover all the accessible part of the trachea, which in the latter stages of the tumor termed bronchocele, is too frequently the case, this operation is inadmissible ; but much benefit may be derived from it whenever it can with safety be performed.

5. An instance is mentioned by Dr. Richter, of an inflammation of the tongue arriving at such a height as entirely to obstruct the passage to the fauces ; and different instances have occurred of mercurial salivations, when carried too far, inducing such a tumefied state of the glands in the mouth and throat, as to be attended with the same effect. In one case that I met with several years ago, and in which the glands of the throat were naturally large, such complete obstruction was produced to the passage of the air, as required the aid of this operation to save the patient. In this instance, such a quantity of mercury had been quickly thrown in, that the swelling of these glands arrived at an alarming height in the space of a few hours from its commencement ; and although all the remedies usually employed in such cases were put in practice, none of them had any effect : the operation was, contrary to my opinion, delayed till the patient was almost completely suffocated ; but he revived instantly on the perforation being made.

6. Swellings of the amygdalæ and contiguous parts, which do not terminate speedily in suppuration, when they become large are apt to induce an obstructed respiration ; and may thus render bronchotomy necessary. It is not such tumors, however, as originate entirely from inflammation that most frequently come

this length : hard swellings of the amygdalæ, when attacked with inflammation, are sometimes known to produce such tumors in the fauces as entirely shut up the passage, which none of the usual remedies will remove ; and which, therefore, require the aid of this operation. But in real inflammatory tumors of these parts, constituting the angina inflammatoria of authors, unless the glands have been morbidly enlarged before the commencement of inflammation, the swelling will seldom or perhaps never, proceed to such a height as to require it. When swellings of this kind arrive at a large size, we almost constantly find, that they do so from their having gone into a state of suppuration, when relief may be obtained by means of a more simple nature than bronchotomy, namely, by discharging the matter contained in the tumor by an incision or a puncture. A common scalpel or bistoury, wrapped up with a piece of linen near to the point, is generally used for puncturing the amygdalæ and other parts of the fauces ; but no precaution whatever will render this a safe instrument for these purposes. In Plates XL. and IX. are represented different forms of canulas containing concealed lancets, which every surgeon ought to have, as by means of them any part of the throat may be scarified with safety.

7. Among the means employed for restoring the circulation in people who have been long under water, or where respiration has been obstructed in any other manner, blowing air into the lungs, and repeatedly discharging it, is, perhaps, more to be trusted than any other ; for, the action which is thus given to the lungs is readily communicated to the heart itself. The usual method of throwing air into the lungs in such cases, is by blowing forcibly into the mouth while the nostrils are compressed ; or by means of a curved tube inserted at one of the nostrils, so as to make its extremity terminate immediately above the glottis.

But, although one or other of these methods may, in some instances, answer the purpose of filling the

lungs with air, yet I know from experience, that it will not commonly succeed. In different instances of people who had been a few minutes under water, several attempts of this kind were made for throwing air into the chest; but, either from some contraction of the epiglottis, or of the superior part of the larynx, none of them were found to succeed; and, as bronchotomy was in both cases obliged to be performed for effecting it, I am therefore warranted in mentioning this as one cause that may render it necessary.

When, from any of these causes, respiration becomes so much obstructed as to endanger the patient's existence, bronchotomy should be immediately advised; and the method of performing it is this.

Whenever it is necessary to have a patient firmly secured during an operation, he should always be placed upon a table; and as this is a matter of much importance in bronchotomy, a table should be preferred to a chair. The patient being laid upon a table, with his head drawn back and limbs secured by assistants, a longitudinal incision should be made with a scalpel, through the skin and cellular substance on the middle and inferior part of the trachea, beginning at the inferior part of the thyroid cartilage, and proceeding downwards for the space of an inch. The sterno thyroidei muscles are thus brought into view; and being separated from one another, a considerable portion of the thyroid gland is in this manner laid bare. As this gland is plentifully supplied with blood vessels, and as the division of any of these proves always troublesome, and in some instances even dangerous, it should with much attention be guarded against. This may commonly be easily done, by avoiding the inferior portion of the gland, where the two lobes of which it is composed unite, and finishing the operation at the upper part of it where they separate. In order, too, to guard as much as possible against the inconvenience arising from the division of the arteries of this gland, the incision should be slowly made; and, as the arteries are

of such magnitude as to be perceptible to the naked eye, they may, with due care, be avoided.

The cellular substance lying between these portions of the gland being cautiously removed, the trachea is thus laid bare ; and if no large blood vessel has been divided, the operation may be immediately finished, by making an opening between any two of the cartilages ; but if any large artery has been cut, it must be secured with a ligature before going further. Authors differ much in their opinion of the best manner of finishing this part of the operation. By some we are desired to make an opening with a scalpel, while others prefer the point of a lancet ; and by all, the perforation is advised to be of such a size as to receive a tube or canula of silver, through which a quantity of air may be transfitted fully sufficient for the purpose of respiration ; but, as much mischief ensues from blood getting into the trachea, by the convulsive cough which it induces ; and as this can scarcely be prevented in the usual manner of performing the operation, it has been proposed to employ a cutting instrument adapted to a canula of a proper size for being left in the opening. Descriptions of instruments for this purpose may be met with in the works of the ingenious Dr. Richter of Gottingen,* to which I have already referred, and also in the fourth volume of the *Memoirs of the Royal Academy of Surgery of Paris*, by Mr. Bauchot.

An instrument which I consider as an improvement upon these, with which I have twice performed this operation, is delineated in Plate XXIII. fig. 3. It is nearly of the form of a flat trocar, but not quite so long. The patient's head being still supported and somewhat drawn back, the point of the stilette must be made to penetrate the membrane between two of the cartilages ; and the extremity of the canula being pushed fairly into the trachea, the stilette is to be with-

* Vide Augusti Gottlieb Richteri D. Medicinæ Professoris Gottingensis, *Observ. chirurg. Fascicul. secund. cap. iii. Gottingæ, 1776.*

drawn, and the canula afterwards secured, by a piece of tape connected with it being tied on the back of the neck.

The instrument is here represented without encumbrances from the dressings; but before being introduced, it should be passed through the centre of three or four thin compresses of linen: these not only serve to cover the pledget of emollient ointment with which the wound should be protected after the *stilette* is withdrawn, but by withdrawing one or more of them, which may be easily done without moving the instrument, merely by cutting up their sides with a pair of scissors, the length of the canula may thus be augmented at pleasure; and which, in the event of the parts about the wound becoming swelled, is found to be a very important precaution; for, when neglected, a very slight tumefaction on the sides of the fore will throw the canula out. The canula should, therefore, be always of such a length as may obviate the inconvenience that might ensue from this accession of swelling. For this purpose, it should never be less than two inches long: when first introduced, just as much of its extremity should be left uncovered by the compresses as admits of its passing easily into the trachea. If any swelling takes place, one, two, or more plies of the linen being cut off, will still admit of the canula penetrating to the same depth; and, on the contrary, when it happens that the parts are swelled at the time of the operation, as the quantity of tube lodged in the trachea might be too much increased on the swelling being removed, the inconvenience that would otherwise ensue may be easily prevented, by some additional plies of linen being inserted between any two of the compresses.

On experience we find, that a double canula answers best in this operation. When one tube only is used, it is apt to fill with mucus; and as it must frequently be taken out for the removal of this, respiration is in the mean time apt to be impeded: but when

a double tube is employed, the inner canula can be easily removed, cleaned, and replaced, while every inconvenience that would otherwise result from it is prevented by the other being left in the opening. When, therefore, the outer canula of the tube is properly fixed, the other having been previously adapted to it, and the opening in the canula covered with a piece of crape or fine muslin, to prevent the admission of dust, the operation is in this manner completed.

As the intention of this operation is to obviate the inconveniencies arising from an obstructed respiration, it is evident that the canula should be continued in the wound as long as the cause that first gave rise to it exists. If a piece of bone or any other substance has passed into the trachea, and if this cannot be extracted at the opening newly made, a curved probe should be introduced at it, in order to ascertain the situation of the extraneous body; and this being done, another perforation must be made directly above it. In this manner, this cause of the disease may, in some instances, be removed, and when obstructions of a different kind are found to take place, the means best adapted for their removal should be immediately employed. But till the breathing becomes perfectly easy, the canula must be continued; and when at last it is judged proper to withdraw it, the skin should be immediately drawn over the orifice, and retained there with a piece of adhesive plaster, by which means a cure of the fore will soon be obtained.

Dr. Richter, among other improvements which he proposes upon this operation, advises the canula to be curved; but, in the different instances in which I have had occasion to perform it, none of the inconveniencies occurred which the Doctor supposes may proceed from employing a straight one: I have found indeed that the straight canula answers every purpose; and as a curved tube cannot have another exactly fitted to it to be occasionally inserted and withdrawn, this I

think is a sufficient reason for not adopting the curved canula of Dr. Richter.

To such as have not had opportunities of performing this operation, the attention that I have advised, to a proper regulation of the length of the canula, may appear to be unnecessary. This, however, is far from being the case; and much embarrassment would ensue from the neglect of it. The means that I have recommended for this purpose are simple, are at all times easily procured, and upon trial, I have found that they answer the purpose: but a very neat and ingenious contrivance for the same intention has long been exhibited by Dr. Monro in his course of surgery; and of which he has been so obliging as to admit of a delineation being here given. It is represented in Plate XCII. fig. 1.

CHAPTER XVIII.

OF OESOPHAGOTOMY.

SUBSTANCES are frequently taken into the pharynx, which, in passing into the œsophagus, are too bulky to be forced down to the stomach by the muscular exertion of the parts at which they stop. When any part of substances in this situation can be observed on looking into the pharynx, they are in general easily removed with common forceps ; but when they have passed entirely out of the pharynx, and are lodged deep in the œsophagus, this cannot be done ; and in such circumstances we are obliged either to allow the substance to remain where it is fixed ; to push it into the stomach ; or to extract it by laying the œsophagus open.

When the substance resting in the œsophagus is of a soft texture, such as bread, cheese, or even flesh, the easiest and best method of getting free of it is, to push it into the stomach with an instrument termed a probang, Plate IX. fig. 1. and 2. This is much safer and easier than to attempt to bring it up, as is frequently advised, by a strong emetic ; for when this does not succeed, the exertion of vomiting in this obstructed state of the œsophagus is very apt to do harm.

But when a pin, a piece of sharp bone, or any other firm substance, is fixed in the passage, we should by no means attempt to push it down ; for, by doing so, if it does not go into the stomach, any point or roughness with which it is furnished, might be pushed directly into the substance of the œsophagus, as in several instances I know has happened.

I think it necessary to observe, that this is a point of importance, and ought therefore to meet with attention. In every case of obstruction of the œsophagus, arising from a foreign body being fixed in it, it is almost the universal practice to endeavour to push it into the stomach. When the obstructing substance is of a soft yielding nature, such as bread, or a piece of flesh, this may commonly be done with safety; but for the reason that I have given, it will very frequently do mischief when it is hard. In every case, therefore, where the pain is not great; if the breathing is not much affected; and the passage still so pervious as to permit the food to get down to the stomach, no attempt should be made for removing it; for we know from experience, that in most instances every thing of this kind is at last carried down, either by the action of the œsophagus itself, by some degree of dissolution taking place in the substance lodged in it, or by some partial suppuration forming in the œsophagus, by which that part of the extraneous body that was fixed in it becomes loose.

But where the obstruction is so complete as to prevent the passage of nourishment to the stomach, or when the breathing is much interrupted, if the cause of obstruction cannot be removed by other means, it comes to be a question whether any attempt should be made for taking it out by incision. As the œsophagus lies deep, being covered with the trachea, and as different blood vessels and nerves of magnitude and importance lie near it, it has always been very justly considered as dangerous to make an incision into it; and in general it has been laid down as an established maxim never to attempt it.

But although no practitioner would think it advisable to perform this operation without some reason of importance, yet in such instances as those to which I allude, where much danger must ensue from any material interruption being formed, either to the passage of food to the stomach, or of air into the lungs, it

would surely be preferable to give the patient a chance even from this doubtful remedy, than to allow him to meet a certain and miserable death.

Notwithstanding a very general prejudice that prevails against this operation, I think we are sufficiently warranted in recommending it in those causes of obstructions in the œsophagus that cannot be otherwise removed ; and the opinion is founded on the following circumstances : wounds in the œsophagus, whether inflicted by accident or design, have been frequently cured, different instances of which have fallen within my own knowledge, the most remarkable of which was the case of a man, who, in an attempt to destroy himself, cut the trachea on the right side completely through, and likewise penetrated the œsophagus ; and among other instances recorded by authors of wounds in the œsophagus being cured, one is mentioned by Bohnius ; in which, from the food passing freely out at the wound, it was evident, that the œsophagus was injured, and yet a cure was easily accomplished.

By various experiments, this operation is found to be safely practicable on dogs and other animals, in which the structure of the parts concerned is nearly the same as in the human body : it has been repeatedly done on the dead subject, without any injury to the contiguous large blood vessels or nerves ; and, lastly, there are at least two instances upon record, of its having been performed with safety and success on living subjects.* I have therefore no hesitation in saying, that cases may occur in which it may be proper to cut into the œsophagus.

Besides those obstructions arising from the causes that I have mentioned, instances sometimes occur of the œsophagus being so completely stopped by constrictions and tumors, that all communication between the mouth and the stomach is cut off.

* Vide Mémoires de l'Académie Royale de Chirurgie, tom. iii. p. 14. Paris, 1756.

When the stricture is seated in the superior part of the œsophagus, making an opening into it may, in some instances, be sometimes advisable, with a view to the conveyance of nourishment into the stomach : any advantage, however, to be obtained in such cases from the operation, will in general prove only temporary, as diseases of this kind have hitherto resisted every attempt that has been made for removing them.

By many anatomists the œsophagus is represented as lying evidently to the left side : if it stretches however to the left, it is in a very inconsiderable degree ; but this consideration may render it proper to prefer the left side for this operation ; the method of performing which is this : the patient being secured in the manner I have desired for bronchotomy, and his head drawn back and kept firm by an assistant, an incision should be made with a scalpel, at least two inches in length, directly through the skin and cellular substance, keeping close by the side of the trachea, and commencing about half an inch above the seat of the obstructing substance when this can be done ; and where this is impracticable, by the obstruction being within the cavity of the chest, the incision should commence about an inch and a half above the breast bone.

The cellular substance being freely divided, the sterno thyroidæi and sterno hyoidæi muscles, together with a portion of the thyroid gland, will be brought into view : with a flat blunt hook, one assistant should pull the muscles gently to the left side, while another by the same means is employed in pulling the trachea somewhat to the right, so as to admit of the œsophagus being brought into view. If any large blood vessel is thus unavoidably divided, it should now be secured with a ligature ; and this being done, the operator is to proceed to open the œsophagus. When the piece of bone or other substance fixed in the passage is discovered by the finger, the perforation should be made directly upon it, and the cut, which should al-

ways be longitudinal, being made of a sufficient size for extracting it, this should be immediately done with small forceps. But when the cause of obstruction is found to lie within the cavity of the chest, which must add greatly to the hazard of the operation, the œsophagus ought in this case to be opened immediately above its entrance into the chest ; care being taken, in order to give sufficient room for what is to follow, that the opening in the œsophagus be extended upwards to the full height of the external incision. This being done, a large firm probe should be introduced, in order to determine the seat of the obstruction, when by means of long small forceps, the substance producing the mischief should be cautiously laid hold of, and slowly extracted.

The operation being in this manner finished, all our attention is to be given to the treatment of the sore, and nourishment of the patient. When the operation is performed for some disease in the superior part of the œsophagus, till this is either removed by medicines, or by an operation, which in cases of compression from tumors may sometimes be done, our principal object is the conveyance of nourishment to the stomach : in such instances, there is a necessity for preserving the opening in the œsophagus. But when the operation has been performed for the purpose of removing a foreign substance fixed in the passage, as soon as this is accomplished, nothing should be omitted that can tend to promote an immediate reunion of the divided parts. If, in such circumstances, the patient is allowed either to eat or drink much, the opening in the œsophagus will be found difficult to heal, and may become fistulous. It will therefore be more prudent to recommend total abstinence from solid food for several days, and to convey nourishment, in the form of strong soups, by the anus, and allowing very small quantities of milk or soup to be swallowed from time to time : by preventing the patient from moving his neck, and treating the wound in the same manner

with similar affections in other parts, we know from experience, that a cure may at last be obtained ; and, at any rate, if this should not happen, and if the wound should remain fistulous, or even if death should succeed, still the operator will have the consolation of having attempted every probable means for the safety of his patient. In addition to what I have already observed of the propriety of this operation in particular cases, I may remark, that the hazard attending it is not so great as is commonly imagined. If the incision is made in the manner I have directed, close by the side of the trachea, no injury can be done to any of the larger arteries or veins : the only blood vessels we have to be aware of, are those branches of the laryngeal artery that supply the thyroid gland. With proper caution, the principal arteries of the gland may in general be avoided ; but if any of them should be divided, they may commonly be secured with ligatures, especially if the external incision is sufficiently free : in proceeding with caution too, that branch of the eighth pair of nerves, which from its inverted direction has been termed the recurrent nerve, and which runs close by the side of the oesophagus, may in general be avoided ; and even in the event of some branches of this nerve being divided, the only bad consequences that probably would ensue, would be some degree of weakness in the voice ; for the muscles of the larynx, in which they are chiefly spent, do not depend entirely upon them.

CHAPTER XIX.

OF DISEASES OF THE NIPPLES.

THE nipples are in some cases so deeply sunk in the breast, that a child in attempting to suck, finds it difficult or even impossible to lay hold of them.

To remedy this inconvenience, different means are employed. If the prominent part of the breast can be pressed so far back as to uncover even a small part only of the nipple, it may commonly be drawn out by getting a stout child of six or eight months old to suck it: but as this cannot be always done, glasses of different kinds are employed for the purpose. In Plate LIII. figs. 1. and 3. are represented two forms of glasses with which the breast may either be sucked by the patient herself or by an assistant; and fig. 2. is a glass cup mounted with a bag of elastic gum. In using this, the air must be pressed entirely out of the bag, when the cup being placed upon the breast so as to include the nipple, such a degree of suction is produced as very commonly draws it out. The bag, however, should be much larger than usual, otherwise it does not act with sufficient force. But whichever of these means is employed, it should be continued till the nipple is drawn fully out; and always repeated before the child attempts to suck.

The nipples, like every other part of the body, are liable to ulcerations; but from their peculiar delicacy, any sores with which they are attacked, are always productive of much distress, while the sucking of the child tends not only to render them worse, but of much longer duration than they otherwise would be. Cracks or chops in the nipples have not a formidable appearance, but they are commonly much

more painful than ulcers of the greatest extent in other parts of the body.

Various remedies are employed for these affections, but emollients are most frequently used: I have not found, however, that they ever give permanent relief; for although they may procure temporary ease, it seldom or never proves of long duration. Mild astringents and drying applications prove more useful. As a wash, lime water, weak saturnine solutions, and solutions of allum, prove serviceable; and port wine and water, or brandy sufficiently diluted, may be employed for the same purpose. After bathing the parts with one or other of these, the nipple should be covered with soft lint, spread with unguentum nutritum, or Goulard's cerate; but of these the first is the best: I have often used it with advantage, and I know of nothing that answers so well in chops or cracks wherever they are situated. It is proper, however, to observe, that the nipple should be entirely cleared of this application always before the child is allowed to suck; for as lead forms the most important part of it, mischief might ensue from much of it being carried into the stomach.

Till the nipple is completely healed, the child should not be allowed to suck oftner than is quite necessary; and when one of the nipples only is sore, this may be easily managed, as the child may be kept at the sound breast, while the other is drawn from time to time with a glass which does not injure the nipple. In Plate LIV. fig. 2. 3. and 4. small cups are delineated for protecting the nipples during the cure. When properly fitted to the parts, they not only protect them from the friction of the clothes, but allow the milk to run off as quickly as it falls from the breast.

CHAPTER XX.

OF THE AMPUTATION OF CANCEROUS MAMMÆ.

CANCER has been known to attack almost every part of the body ; but we meet with it more frequently in the breasts of women than in almost any other part.

In Chapter II. Section VIII. I entered fully into the consideration of cancer : I have now, therefore, to refer to that part of the work for the description and diagnosis as well as for the medical treatment of the disease ; and in this chapter, I shall chiefly adhere to the removal of cancerous tumors of the mammæ by amputation.

A real cancer is perhaps the most formidable disease to which the human body is liable : wherever it is seated, its consequences are to be dreaded ; but more especially when fixed on one or both of the mammæ. Various causes have been assigned for cancer proving more malignant in this situation than in others ; but the obvious reason of it is, that cancers being very commonly seated in glands, and the breast being entirely glandular, cancer is necessarily more apt to form in it than in parts not so extensive.

In Chapter II. Section VIII. I endeavoured to shew, that cancer, on its first appearance, is perhaps, in every instance, a local disease ; that the cancerous diathesis is produced, not by any original disease in the constitution, but by absorption, from a local ulcer ; and hence I observed, that cancerous sores should be removed by immediate amputation, wherever this can be done.

This, I think, should be an established maxim in the treatment of cancer wherever it is situated ; but

from its being more apt to infect the constitution, when seated on the mammæ than on other parts of the body, this is an additional reason for early amputation in cancer of the breast.

As every schirrous gland in the mammæ is apt to degenerate into cancer, and as indurations of the mammæ have hitherto resisted the effects of every other remedy, early amputation should in every instance be advised : this, I know, is a point with respect to which practitioners are not agreed ; some having alleged, that, as schirrous glands in the mammæ have been known to remain in an indolent, inoffensive state for a great length of time, their removal should never be advised till they have actually gone into a state of ulceration.

But this opinion, which is evidently founded in timidity, has been the cause of much unnecessary distress to a great proportion of all by whom it has been followed ; while it has served to bring the operation of amputating cancerous breasts into a degree of general discredit, which it does not merit. There is no fact of which I am more convinced, than that many more would recover by means of the operation, were it employed in a more early period of the disease, particularly while the glands are still in a schirrous state, and before any matter is formed in them : and as instances of their remaining long in an indolent state are exceedingly rare, no dependence should ever be placed on their doing so. It is not a single instance or two, in matters of such importance, on which an opinion ought to be formed : it is the result of general observation that ought to direct us ; and every unbiassed practitioner must confess, that what I have here asserted respecting this matter is, at least in general, well founded.

The propriety of amputating schirrous breasts early being admitted, and the practice established, it may possibly happen in a few instances, that schirrous tumors of this part may be removed, which might have

remained in an indolent state for some time longer. But as this would not frequently be the case; as we have no means by which we can judge with certainty, between such cases as might remain for some time in this indolent state, and those which might proceed more rapidly; and especially, as the advantages derived from early amputation are unquestionably great; no hesitation should occur in putting it universally in practice.

When practitioners, therefore, have an opportunity of amputating cancerous or schirrous breasts early, they ought always to embrace it. It often happens, however, from an improper delicacy in patients, as well as from other causes, that practitioners are not consulted till the disease is far advanced. But, although the advantages to be derived from the operation will, in general, be in proportion to the previous duration of the disease; yet on all occasions, even in very advanced stages of cancer, it is right to advise it, provided the parts affected can be completely removed. When this cannot be accomplished, from the cancerous parts lying too deep, or being immediately connected with organs essentially necessary to life, by which amputation of the one cannot be performed without much injury being done to the other; in such circumstances, as the operation would not be of any real utility, it should not be advised; for, as all the diseased parts could not with propriety be removed, and as the cancerous virus is of a very assimilating nature, it would answer no beneficial purpose to amputate only a portion. But in every instance where the diseased parts can be safely separated from the sound, as nothing but their removal can afford any chance of safety, I must again say, that we should not hesitate to advise the operation. I shall now proceed to describe the method of performing it.

In every chirurgical operation it should be an established maxim to save as much sound skin as possible. Such portions of the common teguments as are diseased, or that adhere firmly to the parts below, ought

certainly to be taken away ; but it can never be proper to remove more than this : for it is now universally known, that the cutis vera is never regenerated ; and when destroyed, that the parts underneath are afterwards covered with thin scarf-skin only. This, however, is not the only objection to an extensive removal of skin : in every operation where much of it is destroyed, the wound that remains is necessarily much more extensive, and the cure therefore more tedious, than when little, or perhaps no skin has been taken away. Indeed, this is so much the case, that in operations where no skin has been removed, cures will be sometimes accomplished in a few days, which, by the removal of much skin in the usual way of performing the same operation, would be protracted to many weeks or months.

This practice of removing much skin in the amputation of tumors, seems to have originated from an idea that has long and very universally prevailed, of the skin being by much distention apt to lose its tone so entirely as not to be able to recover it again ; and therefore, that in every such instance, a considerable part of it should be taken away. This, however, is by no means the case ; and whoever will adopt a different practice, will find, that tumors rarely or never become so extensive as to destroy the elasticity of the skin that surrounds them. Inflammatory tumors, indeed, proceed frequently with such rapidity to a large size, as to distend the skin more quickly than it can properly bear, and at last burst it entirely when suppuration takes place : but in almost every other variety of tumor, the progress of the swelling is so slow and gradual, that the natural contractile power of the skin is seldom or never so far destroyed by it, as to prevent it from recovering its tone on the cause producing the distention being removed : and in cases of scirrhus breasts, this contractile power of the skin is commonly so remarkable, that even when the breast is much enlarged, and all the glandular part of it re-

moved, the skin, if it has been preserved, almost constantly contracts to the size of the remaining fore ; so that in all such cases, none of the skin should be removed that is not either actually diseased, or adhering so firmly to the parts below, that it cannot be easily separated.

In proceeding to the operation, the patient must be either firmly seated in an arm-chair, her head being supported with a pillow by an assistant behind, whilst her arms are properly secured by an assistant on each side ; or she may be placed upon a table, which answers better than any other position : in this manner she is more easily secured ; faintings are less apt to occur ; and the surgeon proceeds with more ease through every part of the operation, than when the patient is seated in a chair. But in whatever position she may be placed, the surgeon should for certain be seated : surgeons indeed, perform this operation most frequently while standing before the patient ; but no operator will ever attempt it in this manner, who has once experienced the advantages that result from doing it in the manner I have advised.

In the first place, I shall suppose the operation to be performed for a schirrus of the mamma, while the skin is still sound, and without adhering to the parts beneath. In these circumstances, an incision should be made with a scalpel through the skin and cellular substance, from one extremity of the tumor to the other ; taking care to direct the scalpel so that it may avoid the nipple, by carrying it an inch or so to one side of it. When the disease has extended, as it sometimes does, beyond the mamma towards the sternum, as this commonly throws the longest diameter of the tumor across the body, this external incision should run in a direction corresponding to the length of the tumor, by making it to commence at one side of the mamma, and terminate at the other ; but when the mamma alone is diseased, the external incision should run in a perpendicular direction, commencing at the

upper part of the tumor, and finishing at the most depending point of it. By this means, any matter that may form during the cure is freely discharged ; which does not happen when the incision runs in a transverse direction, unless the inferior portion of the teguments is afterwards divided from above downwards ; which in such cases, should always be done : for although, in some instances, a cure is easily obtained, even where this precaution is not kept in view, yet in general, some inconvenience would ensue from the neglect of it.

The skin and cellular substance being thus freely divided, are now to be separated from the diseased parts below by a slow and steady dissection ; and this being accomplished, the teguments should be kept asunder by assistants, till all the glandular part of the breast is dissected from the pectoral muscle and other parts with which they are connected. With a view to preserve the pectoral muscle as much as possible from being cut by the scalpel, the arm of the affected side should be kept extended somewhat above a horizontal direction ; by which means all the fibres of this muscle are preserved in a state of extension, and are thus less liable to be injured during the operation than when they are kept relaxed.

It often happens, indeed, that the diseased parts adhere to the pectoral muscle ; and, in some instances, even to the periosteum of the ribs. In such cases, as all the diseased parts must be removed, we should not hesitate to use every necessary freedom with the pectoral muscle, as well as with every other part to which the mamma adheres ; but whenever the removal of the disease can be accomplished without injuring these parts, it ought undoubtedly to be done.

On the mamma being removed, the operator should examine with much accuracy, not only the surface of the sore, but the parts beneath the edges of the divided skin ; and if any indurated glands are discovered, they should all be removed. In this part of the ope-

ration, much care and attention is requisite ; for unless all the diseased glands are removed, no advantage will be derived from it.

I have desired that the whole glandular part of the mamma should be removed. Even where a small portion of it only is diseased, the whole should in general be taken away ; for no good purpose can be answered by a portion of it being left ; and in many instances where this had been done, mischief ensues from the disease making its appearance again in some part of the glands which remain. When indeed it is found that a single loose gland only is diseased, it may be taken out without injuring the rest of the breast ; but whenever the disease is extensive, the whole mamma should be removed.

The next step in the operation is to secure the divided arteries, and it should always be done with the tenaculum. As the arteries of the mamma are frequently small and numerous, much attention is necessary to discover them. All the coagulated blood should be effectually cleared away with a sponge and warm water ; and if the patient is faint, a glass of wine or some other cordial should be exhibited ; by which means small branches of arteries are often discovered which otherwise would escape notice, and which if neglected might induce much hazard and distress.

The blood vessels being thus secured, and the surface of the fore cleared of blood, the divided teguments should be brought together ; and, in order to secure them with accuracy in their situation, ligatures should be introduced at those points where they are most likely to answer the purpose. I have sometimes employed slips of adhesive plaster instead of ligatures, but they do not retain the parts so exactly in their situation ; and the pain which ligatures excite is too trifling to be mentioned.

In securing the teguments in this manner, care must be taken to leave all the ligatures of the arteries hang-

ing an inch or two out from the wound, so that they may be withdrawn in a few days ; which in general may be easily and safely done when they have been applied with the tenaculum.

In order to promote the adhesion of the teguments to the parts beneath, moderate pressure should be applied over the whole by means of the napkin and scapulary bandage ; but before applying it, the parts should be all covered with a piece of soft lint spread with any emollient ointment, and over this there should be a thick compress either of lint, tow, or soft old linen.

In this manner, when no portion of the teguments has been removed, as the whole fore will be covered with skin, a cure will be obtained by a process which surgeons in general have termed the first intention ; that is, without the formation of matter.

But it does not often happen that the operation is advised whilst this mode of practising it is admissible. In general, before a practitioner recommends amputation of a breast, and still more frequently before a patient consents to it, a considerable portion of the external teguments are so much diseased, as to render it necessary to remove them along with the glandular part of the mamma ; or, if the skin is not actually diseased, it commonly adheres so much to the most prominent part of the breast, that it cannot be separated from it. In either of these circumstances, some portion of the skin must be removed along with the mamma ; and the easiest method of doing it is this : a longitudinal incision should be made, in the manner I have advised, through such parts of the teguments as are perfectly sound, whilst that portion of the skin that is diseased, or which adheres firmly to the glandular part of the breast, should be separated from the sound skin, by a circular or oblong incision, with which the longitudinal cut ought to communicate ; and this being done, the operation is to be finished by dissecting off every part that is indurated, along with that por-

tion of the skin which in this manner has been surrounded with an incision such as I have mentioned.

In the after state of the fore, a material difference takes place between the operation that I have now described, and that in which there is no necessity for removing any portion of skin. Where none of the skin is removed, the divided teguments on being drawn together cover the fore completely; an adhesion commonly takes place over the whole; and the cicatrix that ensues is inconsiderable: but when any portion of skin is removed, a fore is always left, which not only renders the cure tedious in proportion to the quantity of skin that is taken away, but the cicatrix is necessarily of the same size; by which much tenderness and irritability is left in the site of the disease, which I am convinced has often some influence in making it return.

The fore that remains after the operation, should be treated with the mildest dressings. When any hemorrhagy takes place from the surface of the fore, and is not removed on the larger arteries being secured with ligatures, dry lint should be applied for the first dressing; but for all the after dressings, lint covered with any emollient ointment should be preferred. Mild emollients never give pain, which dry lint is very apt to excite; and they certainly admit of a more quick formation of granulations than any dressings that give irritation.

I have hitherto been supposing that the disease occupies the mamma only; but the lymphatics leading from the breast to the armpit are also often indurated, and likewise the glands in the armpit itself. In some instances, too, a number of diseased glands are found to run from the breast to the clavicle, and to spread in considerable clusters along both the upper and under edges of that bone.

In such circumstances, the amputation of the mamma itself must be managed in the manner I have already advised; but besides this, an incision should be

made through the skin and cellular substance from the further extremity of every cluster of hardened glands, and made to terminate in the principal cut produced by the removal of the mamma. Thus, when the glands in the armpit are enlarged, although they might frequently be pulled out either separately or connected together, by a hook insinuated below the sound skin at the fore in the breast ; yet it answers the purpose better, to lay the glands first bare by an incision in the manner I have advised, and then to dissect them cautiously out with the scalpel. In the course of the dissection, a good deal of assistance may be obtained from passing a strong ligature through the largest gland ; by which the whole cluster with which it is connected may be elevated from the parts below, so as to admit of their being more easily cut out with the scalpel : and it often happens, that these indurated glands run so near to the axillary artery, as to render it highly proper to use every probable means for rendering the dissection safe and easy.

In like manner, when a cluster of diseased glands is found to extend towards the clavicle, or in any other direction, after the teguments have been freely divided, the glands themselves should be totally removed ; and both here and in similar affections in the armpit, the divided teguments should be brought together, and retained in their situation, either by means of compression alone, or, when this is not sufficient, by the introduction of one or more sutures.

The point that I more especially wish to inculcate respecting this operation is, the propriety of saving as much skin as possible. The necessity of this had rarely, if ever, occurred to our forefathers : and accordingly the common practice has been, to remove all the skin corresponding to the morbid parts underneath : by which much unnecessary pain is produced ; a very extensive and ugly sore is left ; and the cure is always tedious. Instead of which, although it may not in every instance be practicable by the means that I have

advised, to cover the fore entirely with skin ; yet, in all cases, a considerable part of it may for certain receive this important advantage ; by which the extent of the fore will be much diminished ; a cure will be proportionally sooner effected ; and by the cicatrix being less extensive, the risk of the patient in future will probably be less also.

The propriety of saving as much skin as possible, not only in this operation, but in every other where an extensive fore is commonly left, particularly in amputating the extremities, has always appeared to me to be a matter of such importance, that, from the time of my entering on the operative part of business, I have taken all opportunities of putting it in practice. Ever since the year 1772, I have managed cancerous breasts in the manner I have now mentioned, that is, by endeavouring to save as much skin as possible ; and the advantages derived from it have been very considerable.

Till of late, the only means put in practice for securing the skin in its situation, so as to effect an adhesion between it and the parts underneath, was compression by the napkin and scapulary bandage, excepting in a few cases in which adhesive plasters were employed. But as ligatures give very little pain, and as they retain the parts more certainly in their situation, I now employ two, three, or more, according to the extent of the divided parts ; and they always answer the purpose.

CHAPTER XXI.

OF THE PARACENTESIS OF THE THORAX.

SECTION I.

General Remarks on this Operation.

THE operation of the paracentesis, or tapping the thorax, is always indicated where the action of the heart or lungs is much impeded by fluids collected in the cavity of the chest.

Hitherto this operation has been supposed to be applicable to the evacuation of water or of pus only; chiefly of the latter, in the disease termed empyema. But I am clearly of opinion, that it is equally proper for the discharge of any other fluid as for collections of water or purulent matter. The symptoms induced by collections of different fluids, may vary according to the nature of the disease, or of the accident giving rise to their formation. But it is their effect on the motion of the heart and lungs, to which practitioners ought chiefly to attend; and this will always depend more on the quantity than on the kind of fluid that is collected.

The different kinds of fluids met with in the thorax, and requiring to be drawn off by this operation, are serum, blood, pus, and air. Of these I shall treat in separate sections.

SECTION II.

Of Serum collected in the Thorax.

COLLECTIONS of serum in the chest are frequently combined with dropfy in other parts : but we often meet with it as a local affection ; and it is in this case chiefly, that any advantage is to be expected from a chirurgical operation.

Independent of general effusions into the two large cavities of the thorax, dropfical collections are also met with in the pericardium, and in some instances they are confined to the mediastinum immediately below the sternum.

Various and distressful symptoms accompany these collections, but it requires much attention to ascertain their existence, and especially their particular situation, with such precision as can warrant an operation of such importance as the paracentesis of the chest.

A patient who complains of a sense of weight or oppression in the thorax ; of difficult respiration ; of more uneasy sensations in one side of the chest than in the other ; of being liable to sudden fits of starting during sleep, from fear of immediate suffocation ; and if, along with these, he is distressed with a frequent cough ; if the pulse is small and irregular ; and if a dry skin, scarcity of urine, swelled limbs, and other symptoms of dropfy take place, little doubt can remain of water being collected in some part of the chest. A sense of undulation, as of water passing from one part of the breast to another, is sometimes observed by the patient on rising suddenly from a horizontal posture ; and this, I may remark, serves not only to assist in ascertaining the real nature of the disease, but to determine in what particular part of the chest the water is collected. Much attention, therefore, should be given to this circumstance ; for by means

of it we may commonly determine, with some precision, where a perforation ought to be made.

That every possible advantage may be derived from this circumstance, the patient should have his chest uncovered while under examination. When the quantity of collected serum is considerable, it may commonly be discovered by placing one hand upon the anterior part of the ribs near to the sternum, and striking with some force near to the back-bone with the other ; and if an undulation is perceived in one side of the chest and not in the other, the seat of the disease is thereby obvious. But when the quantity of fluid is not great, this trial is not to be trusted. In this case, a person standing behind the patient upon a chair, should be directed to take a firm hold of the upper part of his body, and to swing it repeatedly by sudden jerks from one side to another ; and if water is contained in the chest, it will thus be very certainly found to undulate, and an evident noise will arise from it. I have met with different instances of this, in which the existence of the disease was thus precisely determined.

In long continued collections of serum, assistance in the diagnosis is sometimes obtained, from the part in which the water is seated being more prominent than the rest of the chest. It has even been alleged, that all the ribs of one side of the thorax have, in some instances, been found obviously elated, by the water being in such quantities as to prevent them from contracting in the act of expiration. This can only happen in the very late stages of the disease ; but wherever it takes place, it shews with certainty where the water is to be looked for.

When the disease is in the pericardium, nearly the same symptoms take place with those which dropsy produces in other parts of the chest. The most accurate observation indeed will sometimes fail in judging of this ; but in the *hydrops pericardii*, it is observed, that the patient complains chiefly of the middle and

left side of the thorax: and Senac, in his excellent treatise on the structure of the heart, mentions as a characteristic mark of this disease, a firm undulatory motion being perceived between the third, fourth and fifth ribs on every pulsation of the heart.

As it is not in any respect necessary to enter minutely into the investigation of the causes of these collections, all that I shall say respecting it is, that whatever tends to produce dropsy in other parts of the body, will have a similar effect in forming it here.

The existence of water in the thorax being ascertained, and the part in which it is collected being discovered, if the medicines employed in the cure shall fail, and if it is evident that the patient must die if the operation is delayed, it ought certainly to be advised without farther delay: perforating the thorax is no doubt an important operation, and it ought not to be advised but in real danger. I do not, however, hesitate to say, that it should be performed in every instance where the attending symptoms are hazardous, and cannot be removed by other means; and the method of doing it is this:

The patient should be laid in a horizontal posture, with the side in which the perforation is to be made laid over the bed: when in this situation, the skin over the whole side on which the opening is to be made, should be pulled upwards by an assistant, by whom it should be preserved in this situation during the operation; and the surgeon should now, with a scalpel, make an incision two inches in length between the sixth and seventh ribs, in the very direction of these bones, and at an equal distance between the sternum and back-bone, taking care to avoid the under border of the superior rib on account of the blood vessels running in its groove. But although it is necessary, in order to obtain sufficient room for the scalpel, to have the opening in the skin and cellular substance of this length, there is no reason for continuing it of

the same extent to the bottom ; so that, as the knife passes through the intercostal muscles, the incision may in a gradual manner be shortened to the length of an inch. On the pleura being laid bare, it should be slowly and cautiously divided, in order to avoid all risk of wounding the lungs, lest they should at this place happen to adhere. If they do not adhere, the water will rush out with much force as soon as an opening is made in the pleura ; but if the pleura adheres to the lungs at this place, the incision must either be carried forward to an inch or two nearer the sternum, or another opening will be required, either an inch or two higher or lower in the thorax. As soon as water is found to flow, the silver canula, Plate LXXIII. fig. 6. should be introduced at the opening ; by which means the discharge will not only be more easily completed, but will likewise be more readily stopped, if this should be found necessary, by the patient becoming faint. By doing it in this manner, air is prevented from finding access to the cavity of the chest ; a circumstance of some importance in this operation.

When the water collected is not in great quantity, it may commonly be all drawn off at once ; but as from the structure of the thorax, we are deprived, during this operation, of the advantage of compression, except of that which may be communicated through the abdomen, which must here be very limited, when much water is collected, partial evacuations ought to be made, at longer or shorter intervals according to circumstances. For this purpose, and with a view to give a temporary suspension to the discharge, the canula should be secured by a ribbon connected with it tied round the body of the patient, and stopped from time to time with a piece of cork adapted to its opening. A pledget of emollient ointment should be laid over the wound ; and the whole being secured with the napkin and scapulary bandage, the patient should in this state be laid to rest. After a suitable delay of

a day or two, an additional quantity of water may be drawn off; and by thus taking it away in a gradual manner, all risk may be avoided of the patient being injured by the discharge being too sudden.

In this manner any quantity of water contained in the chest may be drawn off with safety; and the patient being now relieved from the great distress under which he laboured, the canula may be withdrawn, proper means being at the same time employed for preventing a relapse of the disease.

I have hitherto supposed, that the serum is collected in only one of the cavities of the chest; but when both sides are affected, it cannot be all drawn off by one operation. In this case, therefore, after being drawn off from one side, the operation should be repeated in the other; but some risk might occur from performing it in both sides at nearly the same time, by the external air getting access at once to both cavities of the chest: for although I have advised the opening in the pleura to be small, and a canula to be immediately passed into it, yet still it is impossible, even with the utmost caution, to prevent the air from finding access, either by the wound or canula, to the surface of the lungs; and if both cavities of the chest should at the same time be filled with air, nearly the same oppressed state of respiration would take place as was produced by the serum newly discharged. Before the operation, therefore, is repeated on the opposite side, some means should be advised for expelling the air received into the cavity of the chest by the first perforation. This may be done in different ways; the most easy and convenient of which is this: immediately after the canula is withdrawn, let the patient endeavour, as far he dare safely venture, to fill the lungs with air. This will expel a considerable part of what was collected between the pleura and lungs, by the perforation; and if the skin, which was retracted before the operation, be instantly drawn over

the fore, and pressed down by an assistant during inspiration, all access will thus be prevented to the external air ; and by this being frequently repeated, almost all the air collected between the pleura and lungs will be expelled : after which the skin must be drawn over the wound ; and by means of a compress and bandage properly applied, the parts may be made to adhere without further trouble.

Air may also be drawn off from the thorax in the following manner : let an exhausting syringe be fitted with such a mouth of ivory or metal as will allow it to be closely applied over the opening in the pleura. When thus applied, every stroke of the piston will extract a considerable quantity of air ; and as soon as the whole is supposed to be nearly exhausted, the instrument may be removed, and the wound treated as I have already advised, by drawing the skin over it, and endeavouring to heal it by the first intention.

Or instead of an exhausting syringe, one of the elastic vegetable bottles, fitted with the same kind of mouth, may be employed. By expelling all the air out of the bottle, and applying the mouth of it over the wound in the pleura, a quantity of air nearly equal to the bulk of the instrument will be extracted, and it may again be applied as often as is necessary ; care being taken at each removal of the instrument to exclude all access to the air, by drawing the retracted skin over the wound.

Air collected in either of the cavities of the chest, may not only prove hurtful by impeding the motion of the lungs, but it must likewise do harm by that tendency to inflame, that is commonly given to parts naturally secluded from the air, from their being by accident laid open so as to admit of air being freely applied to them. In all such cases, therefore, this circumstance merits particular attention. When one side only of the thorax is laid open, either in collections of water or matter, the oppression produced upon the lungs by the admission of air, is not commonly of

much importance, as for the most part it is expelled by expiration alone. This I know from experience is the case ; but inflammation, as I have already observed, being sometimes induced by air finding access to these cavities, it ought at all times to be rigidly guarded against ; and, as much distress has been induced from both cavities of the chest being laid open at once, it ought never to be attempted.

Our views in what I have ventured to advise in the different steps of the operation, will appear, I hope, sufficiently obvious ; but as some surgeons prefer a different part of the chest, as well as a different instrument, for performing the operation, I think it necessary to consider these points somewhat more minutely.

It has been said, that unless the opening is lower in the chest, the water will not be completely discharged, as all that part of the cavity that lies below the wound will still continue to be filled with it. But, if the patient is laid in a horizontal posture, with his body inclined to the side in which the perforation is made, the spot that I have advised will be found to be more depending than any other ; and in this situation we have this material advantage, that the lungs do not so readily adhere to the pleura, as they do farther down, where they come more closely into contact with the diaphragm ; and here too, the perforation is made with more ease than it can possibly be nearer the spine, where the thick muscles of these parts cannot be avoided.

With respect to the instrument with which the operation is performed, the scalpel, I think, is the best. A trocar has been recommended by many : but however well adapted a trocar is for piercing the abdomen or scrotum, in which none of the contained parts can be hurt if the operation is rightly performed, yet in the thorax much risk must attend the use of it from the adhesions which often take place between the lungs and pleura, and from our not being previously

able to determine whether they adhere or not at the very point in which the perforation is made. In the event of no adhesion being met with, the trocar would no doubt accomplish the intention of the operation, and with perfect safety if cautiously introduced. But if it should unfortunately be inserted where adhesions between the lungs and pleura take place, the lungs would not only be injured, but the operation would not answer the purpose; for the instrument entering the substance of the lungs, it would not come into contact with the water collected between the lungs and the pleura lining the ribs, and consequently no discharge would ensue. With the scalpel, this inconvenience is avoided: on the pleura being laid bare, a small hole should be scratched in it with the point of the scalpel; and as soon as this membrane appears to be penetrated, if no serum is discharged, there will be much cause to imagine that the lungs adhere at this place; and the surgeon will now either desist entirely, and make an attempt in another situation; or if the adhesion between the lungs and pleura is slight, which may be known by the cautious introduction of a blunt edged probe, as much of them may possibly be separated as to allow the canula to pass into the collection of serum: at least this trial may at all times be proposed. If the lungs are easily separated, and if the adhesion is not extensive, the operation will thus be completed; while if the contrary shall ever be the case, the operator will at least have the satisfaction to think that he has done no mischief, which he might not in such circumstances have been able to avoid, if a trocar had been used. After duly attending, therefore, to every circumstance, I am clearly of opinion, that the scalpel should in this operation be preferred to the trocar.

When the disease is seated in the pericardium, it is in some instances so much distended, that on examination, it is easily distinguished. Upon making an

opening in the left side, between any two of the ribs from the third or fourth to the seventh or eighth, and within the distance of five or six inches of the sternum, we can never fail in this distended state to meet with it; and when brought fully in view, by the pleura being freely divided for the space of an inch or two, the best method of finishing the operation, is to push a small trocar into the pericardium. If the quantity collected is small, it may all be drawn off at once; but when considerable, the discharge should be frequently stopt for a few minutes together, with a view to prevent those inconveniencies which might ensue from giving a sudden and free flow to the whole quantity.

When, again, serum is collected in a cyst between the lamellæ of the mediastinum, as it is situated immediately below the sternum, any pain or oppression which it excites, is more confined to the centre of the breast, than we find it to be when the collection is seated in either of the cavities of the chest; and for the same reason, any opening intended to discharge it, must be made directly through the sternum itself, by a piece of that bone being taken out with the head of a trepan, so as to admit of the seat of the disease being laid in view. The method of applying the trepan I need not enter upon at present, as the operation has been already described in a preceding chapter. All that I need farther say upon the subject is, that as soon as the cyst containing the fluid is laid bare, a perforation should be made into it with a trocar; care being taken to manage the discharge in the same cautious manner I have already advised, and not to allow the parts newly laid open to be more exposed to the air than is necessary.

SECTION III.

Of Blood collected in the Thorax.

WHEN blood is collected in large quantities in any part of the chest, the breathing becomes oppressed, and the motion of the heart and arteries feeble and irregular. These, indeed, are symptoms which occur in every collection seated in the thorax; but they arrive at a greater and more distressful height from blood, than from collections of other fluids. In other circumstances, the symptoms arising from blood and serum are so similar, that they need not again be enumerated.

Blood may be effused in the cavity of the thorax by different causes, and of these the following are the most frequent.

1. Wounds that penetrate any of the blood vessels in the thorax.

2. The spiculæ of a fractured rib, and splinters of the sternum and vertebræ, sometimes injure the blood vessels in the thorax.

3. These vessels are sometimes eroded by the matter of an ulcer or of an abscess; and,

4. They may be ruptured by any violent exertion, particularly in the action of coughing.

As it commonly happens, where blood is collected in the chest, that the vessels from whence it is discharged are seated in the substance of the lungs, part of the blood is usually brought up by the mouth in a fit of coughing; and when the quantity discharged in this manner is considerable, it gives relief to the oppressed state of the lungs as well as of the heart; but whenever the action of either of these organs becomes much impeded by a great accumulation of blood, some attempt should be made to draw it off by a perforation: and as blood, when extravasated, coagulates

quickly, and cannot in this state be easily discharged, an opening should be made for this purpose as soon as from the symptoms there is cause to imagine that it is beginning to stagnate.

When the blood is found to be so firmly coagulated as not to pass off by a perforation, it has been proposed to dissolve or to dilute it by injecting warm water or emollient infusions. This, however, is a practice that ought seldom to be advised; for injections, even of the mildest kind, must in this situation be always attended with risk; but when it so happens, that much blood is collected in a coagulated state, and that it cannot be drawn off even by enlarging the opening in the pleura as far as can with propriety be done; and as much hazard would be incurred by allowing it to remain, even a doubtful remedy in such circumstances becomes eligible. In this situation, by frequently and cautiously injecting tepid water, the coagulated blood may be gradually so much softened and dissolved as to be at last discharged. But when we have it in our power to make a choice, it will be much for the interest of our patient, to prevent the necessity of this remedy, which for the most part may be done by making an incision in the manner I have advised, in that part of the thorax where the blood appears to be collected. By some practitioners, particularly by Mr. Sharpe, we are advised, in cases of blood collected in the chest, rather to trust to its being absorbed or coughed up from the lungs, than to endeavour to draw it off by this operation.* Where blood is either extravasated in the substance of the lungs, and is freely spit up, or when collected in any of the cavities of the chest, and in such small quantities as to produce no material impediment to the action of the lungs or heart, it would no doubt be improper to advise it to be discharged by an operation, as in course of time, by bloodlettings

* *Treatise of the Operations of Surgery*, chap. xxiv.

being frequently repeated according to the strength of the patient; by the effect of a low diet, and other remedies usual in such cases, there will be cause to hope that it may be absorbed; and in the mean time, while the quantity of extravasated blood is inconsiderable, no material inconvenience can arise from it. But what I wish to inculcate is, that when such a quantity of blood is collected in either of the cavities of the thorax, as to disturb the functions of the organs contained in it, it ought to be drawn off by a perforation. It is said by Mr. Sharpe, that, by allowing the blood to coagulate in the chest, the orifice from whence it is poured will be more readily stopt, than if it were quickly discharged. But in answer to this, I must remark, that if the wounded vessel is not large, little or no additional risk will be incurred by drawing off the blood as it is poured out, as in this case the hemorrhagy will probably stop on the patient's becoming faint: and on the contrary, if the divided vessel is large, the remedy proposed by Mr. Sharpe will not be sufficient for the purpose; for a wound in any of the large vessels of the breast, will probably prove fatal, whether the operation of the paracentesis is performed or not.

The directions that I have given for discharging serum collected in the thorax, will, in general, prove equally applicable for the evacuation of blood: only, when the collection is produced by a ruptured blood vessel, induced either by a fractured bone, or by some extraneous body pressed into it, the incision should be made as contiguous as possible to the part affected, so that the opening may serve not only for discharging the blood, but for extracting such portions of bone as are found to be detached, or any foreign bodies that may be met with. And again, when a wound with a sharp pointed instrument is the cause of the collection, instead of perforating any other part of the chest, it will commonly answer the purpose better, merely to enlarge the wound; at least, this will always be pre-

ferable, in wounds of the inferior part of the thorax ; but when seated so high in the chest, as to be unfit for discharging the blood contained in it, the operation in that case should be performed between the seventh and eighth ribs, in the manner I have already advised.

SECTION IV.

Of an Empyema, or a Collection of Purulent Matter in the Thorax.

THE marks of oppression on the heart and lungs produced by purulent matter collected in the chest, are very similar to those which proceed from serum, but in collections of pus, symptoms take place which direct our opinion, not only in regard to the nature of the disease, but in pointing out the spot in which it is seated.

It has been asserted, that pus is sometimes deposited in particular parts without any previous inflammation. But this is so very uncommon, that we may lay it down as a fixed principle, that inflammation is a necessary forerunner of purulency ; so that an empyema can never be met with, but as a consequence of an inflamed state of a particular part. When, therefore, such symptoms take place, as indicate the existence of a fluid in the thorax, if they have not been preceded by inflammation, we conclude that they are not induced by purulent matter. But when a patient who has for some time complained of a fixed pain in some part of his chest, attended with heat, a quick pulse, and other symptoms of inflammation, is at last seized with oppressed respiration ; an inclination to sit in an erect posture ; with a total inability of lying on the sound side ; a constant tickling cough ; frequent rigors or shiverings ; and especially if these symptoms are accompanied with an enlargement of the affected side,

or with a soft œdematous fulness of the part in which the pain was at first seated ; we may conclude with much certainty, that a large collection of matter is formed.

Inflammation of some portion of the lungs, or of their coverings, may be induced by various causes. In some instances, families appear to have an hereditary tendency to tubercles in the lungs, which every slight attack of cold is apt to affect with inflammation. A natural contracted state of the thorax seems likewise to predispose these parts to inflame ; and inflammation may be produced here, in the same manner as in other parts of the body, by every variety of external violence.

But by whatever means the contents of the chest may have become inflamed, when this terminates in suppuration, if the matter, instead of being freely discharged by the mouth, as is frequently the case, is found to produce all the symptoms that I have already had occasion to enumerate of oppressed respiration, the only remedy upon which any dependence can be placed, is a perforation,

Practitioners have in general considered this operation as more hazardous than it really is ; and it has been said, that it ought never to be advised, but when the seat of the abscess is clearly pointed out by an external swelling between two of the ribs. When the lungs become inflamed in a part that adheres to the pleura, abscesses may form there ; and when discovered, they should no doubt be laid open. But although the operation for the empyema, as it is commonly termed, is of some importance, and should never be employed but when indicated by necessity ; yet I am not of opinion that it can ever be attended with so much risk as to render the formation of an external abscess the only cause for performing it. When there is reason to think, that previous inflammation in some part of the breast, with evident marks of its having terminated in suppuration, is the cause of oppressed

breathing, and when the symptoms are not speedily relieved by a free expectoration of matter, the operation of the paracentesis should be performed immediately on that spot where the collection is supposed to be seated, whether any external marks of an abscess exist or not. It may frequently happen, that no matter will be discharged on the perforation being made into the chest, for we know from experience, that abscesses are often seated in the substance of the lungs, and not in either of the cavities of the chest. But, even in such instances, the perforation may prove useful, as the lungs, by losing their usual support at a particular point, will more readily yield than they otherwise would do to the matter collected in them: while, if the matter is already poured into the cavity of the chest, a perforation being made into it, is the only remedy that can save the patient. I am therefore clearly of opinion, that, in all such cases, the paracentesis of the thorax should be advised.

The directions given in the two preceding sections, for conducting the perforation, will apply with equal propriety in collections of pus: only, it must be remarked, when the seat of an abscess is pointed out, either by a long continuance of pain in any one point, or by matter being distinguished between two of the ribs, that this is by much the best direction for the place of the incision. But when no such mark is met with, the place that I have advised for the operation when water or blood is to be discharged, will answer equally well for the discharge of matter.

It is likewise necessary to observe, that, in purulent collections proceeding from external injuries, particularly from penetrating wounds, no operation can be necessary, if the wound by which the abscess is produced is so situated as to discharge the matter; but when the wound is found to be too high in the thorax for answering this purpose, an opening in a more depending place becomes necessary; and again, when the matter is seated so immediately below the sternum that

it cannot be discharged by an opening between two of the ribs, a piece of that bone must be removed with the trepan, as I have already advised, when speaking of collections of serum.

In abscesses of these parts, the matter is commonly first formed in the substance of the lungs, and afterwards discharged into one or other of the cavities of the chest. It sometimes happens; however, that large quantities of pus form between the pleura and surface of the lungs, without any apparent affection of that organ; and seem to proceed from an inflamed state of the surface of the pleura. These collections, however, seldom continue long without producing ulceration; and when ulceration has taken place, the discharge of matter that succeeds to the operation of the paracentesis generally continues for a great length of time.

Different causes concur to render the cure of abscesses in the cavity of the chest tedious: the constant motion of the lungs; our not daring to induce that degree of inflammation that we know to act powerfully in producing a reunion of parts that have been divided by the formation of matter; and the effect of compression being precluded by the intervention of the ribs. Although, in a few instances, the quantity of matter gradually becomes less, and the external opening contracts and heals, yet, from the causes I have mentioned, in a great proportion of those who have undergone the operation for the empyema, or who have had large collections of matter in the breast, as the effect of accidental wounds, the discharge continues for a great length of time, most frequently for life. The fore, indeed, will often heal, if it be not artificially kept open; but the matter almost constantly bursts out again, or another operation becomes necessary to discharge it, when it collects again in such quantities as to produce a renewal of the symptoms of oppression on the lungs and heart.

I have already had occasion to advert to this subject when treating of wounds of the thorax, in Chap. III. Sect. XI. At present, I only think it necessary to observe, that although in the treatment of wounds, the general use of tents, whether solid or hollow, has been condemned with much propriety; yet that we are evidently misled by fashion, when we lay them entirely aside in wounds that penetrate the breast. I know that it is the opinion of many practitioners, that tents of every kind should be exploded; but I also know, that patients who might otherwise have been saved, have frequently suffered by this rule being too generally followed. As long as the matter of an abscess in the thorax continues to find an easy vent, and is discharged freely, either by the wound by which it was produced, when this is sufficient for the purpose, or by a perforation made for drawing it off, when this is found to be necessary, there can be no cause for employing tents; and in such circumstances, indeed, it would be improper to use them. But when the opening in the thorax heals too quickly; when, in consequence of this, the matter does not find a free vent, and symptoms of oppressed breathing supervene; in such circumstances, the propriety of preserving a passage for the matter is obvious. Repeated experience has convinced me, that this may be done both with ease and safety, by introducing a short tube of gold, silver, or lead, into the opening, and allowing it to remain for a few hours, as often as a tendency to heal makes it necessary. By neglecting this, and allowing such sores to heal, as now commonly happens, much mischief is done, which with this kind of attention, might be easily prevented.

SECTION V.

Of Air extravasated in the Thorax.

AIR collected in either of the cavities of the chest, excites the same symptoms of oppression on the lungs and heart, as those arising from water, blood, or matter; it therefore becomes equally an object of chirurgical management.

Collections of air may be produced in the thorax by different causes.

1. As the process of putrefaction tends to extricate air from every part of the body in which it takes place, air may be collected in the thorax, from any of the organs contained in it being seized with mortification. This variety of the disease, however, will seldom fall under the care of the surgeon; for the cause by which it is produced can scarcely be supposed to yield to any remedies that may be employed for it; and unless the mortification is removed, no benefit could result from any operation.

2. Air may pass into one or both of the cavities of the chest, from a rupture of the investing membrane of the lungs, and this again may occur from violent exertion in coughing, laughing, and crying, as well as from other causes.

3. The surface of the lungs may be eroded by ulceration, or by purulent matter in contact with them becoming acrid, by which a passage may be given for air into one or other of these cavities.

4. Wounds penetrating the lungs have sometimes produced collections of air in the chest; but in such instances, the wound must be made with a small pointed instrument pushed in an oblique direction. A wound produced by an instrument carried forward in a direct line into the lungs, does not readily produce collections of air, as the air that escapes from the lungs

passes out at the wound : but in oblique wounds, the air does not easily escape, as the parts naturally fall together ; in which state they operate in the same manner as a valve, so that the extravasated air must necessarily collect in one or other of the cavities.

5. The point of a fractured rib wounding the lungs, is apt to induce collections of air in the thorax ; and a fracture of the sternum, or any of the vertebræ, may be attended with the same effect.

These several causes may occasionally produce extravasated air in the thorax ; but we meet with it more frequently from fractures of the ribs than from any of the others.

The symptoms produced by air effused in the thorax differ only from those that occur from serum and purulent matter, in their arriving more quickly to an alarming height : instances have occurred of death being induced in the space of a few hours from the fracture of a rib, merely by air collecting in large quantities between the pleura and lungs : in some, perhaps in the greatest proportion of all that occur, along with this collection of air in the chest, the cellular substance of the breast becomes inflated ; and if means are not soon employed to prevent it, the air insinuates through every part of the body.

It is truly astonishing to observe, how quickly a fractured rib, when it wounds the surface of the lungs, will in some instances induce the most alarming symptoms. The patient at first complains of tightness in the breast, attended with oppression in breathing, along with pain in the parts chiefly affected. This difficult respiration becomes more distressful. The patient cannot breathe in a recumbent posture, and is always easiest when erect and leaning somewhat forward : the face becomes flushed and swelled : the pulse is commonly feeble, and at last it becomes irregular : the extremities become cold ; and if relief is not quickly

obtained, the patient is at last carried off with every mark of suffocation.

The emphysematous swelling of the external parts of the chest, which sometimes takes place here, is easily distinguished from watery effusions, by the crackling produced on pressure; the sensation it communicates being nearly such as is received from pressure upon a dry bladder when nearly filled with air. For the removal of this symptom, scarifications have been employed. By making several incisions, each about half an inch in length, along the course of the swelling, a good deal of air may be discharged, especially if the air contained in the swelling is frequently pressed towards these openings. A considerable quantity, too, of the air collected in the thorax, will be drawn off by the same means: for, as soon as any part of it passes off from the cellular membrane, its place will be immediately supplied from the chest; and if the quantity that escapes by the wound in the lungs, is not greater than the quantity discharged by the scarifications, the whole in this manner may soon be removed. But it frequently happens, that the air forced out from the lungs is much more than can pass off by any number of scarifications that can be made; in which case, any relief that takes place in the oppressed state of respiration, is commonly inconsiderable.

Till of late, patients in this situation almost constantly died; for when scarifications failed in discharging the air, and even this remedy has not been long in use, practitioners were not acquainted with any other means of relief. But we now know, that in all such cases, where the oppressed state of breathing is great, and the symptoms are evidently induced by air collected in the chest, that the same remedy should be employed for removing it, as is found to succeed in collections of any other fluid, viz. the operation of the paracentesis; and it has accordingly, of late years, been frequently performed, and always with complete

success; the tension in the breast, difficulty of breathing, and every other symptom being immediately relieved on a perforation being made through the pleura.*

With a view to prevent the inconveniencies that result from the external air finding access to the cavities of the chest, it has been proposed to make the opening with a trocar instead of a scalpel; and by entering the instrument in an oblique direction, this purpose would no doubt be answered.

When the chest is completely filled with air, and if certainty could be obtained that no adhesions existed between the lungs and pleura, the operation might be performed with safety, and with more ease by the trocar than with any other instrument. But as we can never know with precision whether the lungs adhere or not, I am, for these and other reasons mentioned in a preceding part of this chapter, induced to think that the operation may be done with more safety with the scalpel. And if the directions that I have given are observed, of retracting the skin from the part to be perforated; of introducing a canula immediately into the opening in the pleura, as soon as air begins to escape; and drawing the retracted skin over this perforation into the chest, as soon as the canula is withdrawn, the operation may be done with more certainty of avoiding the lungs, in the event of their adhering to the pleura, and probably with more success in every respect, than when the trocar alone is employed.

The practice, therefore, that I would incline to follow, is, in the first place, to make several incisions along the course of the swelling, each of a half inch in length, and of such a depth, as to pass entirely through the skin into the cellular membrane: and, if these do not afford relief, which, however, they fre-

* This operation, for the evacuation of air from the chest, was first proposed by Dr. Monro, about the year 1760, in his lectures in this University.

quently do, to proceed immediately to perforate the cavity of the chest in the manner I have advised, and as near as possible to the injured part, when the malady has been induced by external violence, if this be not near to the back-bone; in which case the perforation should be in the most depending part of the thorax, as I have already advised in collections of water, blood, and matter. And when produced by violent exertion in coughing, crying, or laughing, the particular seat of the complaint will in general be discovered by some degree of pain in the injured part.

CHAPTER XXII.

OF THE PARACENTESIS OF THE ABDOMEN.

IT is the effect of various diseases to produce collections of fluids in the cavity of the abdomen: occasionally these collections are removed by the internal exhibition of medicines, though in a great proportion of cases, we are obliged to employ the operation of paracentesis or tapping.

There is naturally secreted into the cavity of the peritonæum, a serous exhalation, for the purpose of lubricating and keeping moist the surface of the intestines. Various causes may concur to produce a morbid increase of this secretion; and whenever the quantity collected in the abdomen is large, it constitutes a disease termed ascites.

This variety of dropy often accompanies a general disease of the system, being frequently combined with anasarca; but in some instances it is local, and is evidently induced by compression of the lymphatics; most frequently by schirrous swellings of some of the viscera; commonly indeed by an enlarged state of the liver.

The presence of a fluid in the cavity of the abdomen, is known by the swelling that takes place; by a sense of tightness all over the belly; by the breathing being difficult and laborious, when the patient is in a horizontal posture; and by a sense of fluctuation being communicated to the fingers placed on one side of the belly, when it is forcibly struck on the other. A concurrence of these circumstances will always, to a discerning practitioner, point out the real nature of the disease; but a further confirmation is obtained of

it when the patient complains of much thirst, a dry skin, scarcity of urine, and other symptoms of dropsy.

When the swelling is found to extend equally over the abdomen, the serum is commonly diffused among the different viscera, and is contained within the peritonæum only. It sometimes happens, however, that it is collected in different cysts, or perhaps in one or both of the ovaria; in which case, the tumor is not commonly so equal, nor the fluctuation so distinctly perceived, as when the water flows freely through the whole cavity. This circumstance of fluctuation depends also on the consistence of the fluid; for, we sometimes find it thick and gelatinous, whilst most frequently it is thin and perfectly serous. In some instances, too, an innumerable quantity of small hydatides are found swimming in the serum of ascitical swellings, by which the fluctuation is commonly made obscure.

Whatever may be the influence of diuretics and other evacuants in the cure of general hydropic swellings, they rarely prove useful, as I have elsewhere observed, in local collections. The principal object, therefore, to be kept in view here is, to discharge the water collected in the abdomen, by a surgical operation, as soon as its existence is ascertained; while the most effectual remedies should in the mean time be employed for preventing a recurrence of the disease. This indeed is often impracticable: but, in some cases, cures are accomplished; and it would probably happen more frequently, if the fluid collected in the belly was more early discharged. In general, this is delayed too long; for the bowels must surely be greatly injured by being so long soaked in water, as usually happens in ascites, before the operation is advised. This, too, is the more improper, as the operation of tapping is in itself exceedingly simple. It excites little pain; and any danger attending it does not proceed so much from the nature of the operation, as from the constitution being, in general, much debilitated by the long con-

tinuance of the disease before it is performed ; which renders it liable to consequences that otherwise would not so readily occur, and which frequently terminate fatally. I am so perfectly convinced indeed of this, that I commonly advise the water to be drawn off as soon as a fluctuation is distinctly perceived ; and I have never been sensible of any harm being done by it.

In large collections of fluids, wherever they are situated, more particularly in the abdomen, the situation of a large proportion of blood vessels, it is found to be exceedingly hazardous to discharge their contents suddenly ; owing, as we suppose, to the immediate influence produced upon the circulating system, by our thus depriving it too quickly of a support to which it had for a long time been accustomed.

But whatever may be the immediate cause of the symptoms resulting from sudden evacuations of this kind, the effect is always certain. Syncope often happens ; and death itself sometimes ensues from it. This, in former times, made tapping a hazardous operation ; and when the collection was large, in order to avoid those inconveniencies that ensued from the water being all drawn off at once, it was done at different times, a day or two being commonly allowed to intervene between one operation and another.

This, however, proved very inconvenient and distressful ; and by the frequent introduction of the trocar which thus became necessary, mortification of the wound, and other troublesome consequences were apt to ensue.

The late Dr. Mead, reflecting on the probable cause of those symptoms arising from the sudden discharge of large collections of water, was induced to try the effect of pressure upon the parts in which they are seated, as a substitute for the support of which they are deprived by the evacuation ; and the success attending the practice has fully justified the ideas that he entertained of it ; for when pressure is properly applied, almost any quantity of water that the abdomen

can contain, may with safety be drawn off. It ought however, to be applied with much equality, over the whole belly; and continued without interruption for the space of several days after the operation.

Various means have been proposed for applying equal pressure in this operation; but none of them answers the purpose so easily, and with so much effect, as a bandage invented by the late Dr. Monro, represented in Plate XCI. fig. 2. Two different sizes of this bandage should be always in readiness; so large as to cover the whole abdomen, and to press with equality upon every part of it.

It is not necessary to recapitulate the means used in former times, for discharging hydropic collections; for they are now very universally, and with much propriety, laid aside; the trocar being the only instrument at present employed for this purpose. This instrument, till of late, was always round, with a triangular point. As this form, however, is evidently ill calculated for an easy entrance of the instrument, an object of much importance in the operation, I was led a good many years ago to the use of a flat trocar with a lancet point, represented in Plate I. figure 1. This has always answered the purpose properly; but some improvements have been proposed upon it, by which it is made to enter with still more ease. In Plate LXVII. fig. 2. I have delineated a very neat invention by Mr. Andrée. It has been objected, however, to this instrument, and I believe with good reason, that the canula, by consisting of two sides which fall together with some force on the stylette being withdrawn, may thus lay hold of a portion of intestine; and if this should ever occur, much distress and even danger might ensue from it. In Plate LXXIII. fig. 2. an improvement upon the trocar is given, to which no such objection occurs: it enters with the same ease as a lancet; and the two sides of the canula, by not falling close together, can never injure the intestines.

In performing the operation, it has been said, that the opening may be made with almost equal propriety in any part of the inferior boundaries of the abdomen. This, however, is not the case: for, in the centre of the abdomen, immediately below the umbilicus, and in the course of the recti-muscles, it might fall upon the epigastric artery; and, if carried near to either of the ossa ilia, the intestines would more readily be hurt than if made nearer the navel. The safest and best part for the perforation seems to be, at a point lying at nearly an equal distance between the umbilicus and centre of the spine of the ilium. No large blood vessels can probably be wounded here. The abdominal parietes are not in this part entirely tendinous; but are somewhat fleshy, so that they more readily heal when wounded. None of the intestines can in this situation be readily injured; and when the patient is laid in a horizontal posture, in which he ought always to be during the whole course of the operation, the point that I have mentioned will be found to be more depending than perhaps any other.

The operation being determined upon, the method of performing it is this: the point in which the perforation is to be made, should be marked with ink; and in applying the bandage, Plate XCI. one of the openings should be placed exactly opposite to this mark. The bandage being accordingly applied in this manner, and the straps being put through the buckles, and drawn somewhat tight, the patient should now be laid in a horizontal posture, with his head elevated, and the side to be perforated lying over the side of the bed. The surgeon is now to take the trocar in his right hand; and fixing the head of the stilette in the palm of his hand, while his forefinger directs the point of the instrument, he is now to push it forward till he finds that the end of the canula is entirely through the muscles, and lodged in the cavity of the abdomen; which he may be certain is the case, when he finds no farther resistance to the stilette. The stilette is now

to be withdrawn, and the canula allowed to remain as long as the discharge continues, care being taken to pull the bandage gradually tighter as the water flows off; or, if the patient, notwithstanding this precaution, shall become languid, a total stop should be put to the discharge for a few minutes, which is easily done by the surgeon placing his finger from time to time on the mouth of the canula.

It sometimes happens, that the discharge stops before the swelling is much diminished: when this is owing to a portion of omentum or intestine stopping the extremity of the canula, the discharge is easily renewed by inserting a blunt probe into it, so as to push back whatever may have plugged it up; or when the serum is thick and gelatinous, in order to effect a complete evacuation, it may sometimes be necessary to introduce a trocar of a larger size than that which was first employed. But when it proceeds, as is sometimes the case, from the serum being collected in particular cysts, no attempt of this kind will have any effect: in such circumstances, the canula must be withdrawn, and the wound being covered in the ordinary way with a pledget of any simple ointment, the operation may be renewed either immediately or on the following day, on the opposite side of the abdomen; or if the swelling is confined to any other part of the belly, the perforation must be made in the most depending part of it, wherever that may be.

Dropfical swellings of the ovaria exhibit nearly the same appearances with encysted dropsies of any other kind: only, in collections of this kind in the ovaria, the fluctuation of a fluid is not commonly very distinct; and unless they are complicated with ascites, the swelling is commonly confined to one side of the abdomen.

The propriety of drawing off the water by a perforation, is here, however, equally obvious as in any other variety of the disease: that is, when we wish to diminish or remove the tumor, it must necessarily be

done in this manner ; but I think it right to observe, that, in dropfical fwellings in the ovaria, the difeafe does not increafe fo rapidly as in common cafes of afcites ; neither does it appear to injure the conftitution fo much, and the water not being in contact with the inteftines, we are not in this variety of the difeafe under the fame neceffity of advifing the perforation early.

The ferum being all drawn off, and the opening drefsed in the manner I have advifed, the bandage muft ftill be continued fufficiently tight for preventing thofe diftreffful feelings which the fudden difcharge of it would otherwife be fure to induce : and there is even reason to think, that the fupport which the bandage affords to the weakened parts may have fome effect in preventing a return of the difeafe ; but when, notwithstanding of this, and of fuch internal remedies as are employed, the water is again found to collect, the operation falls to be repeated whenever the fwelling becomes large.

Ascites is perhaps the moft frequent variety of tumor to which the abdomen is liable ; but in fome inftances, inftead of water, tumors of the abdomen are found to contain air, conftituting a difeafe termed tympanites.

The effect produced by this upon the breathing, is nearly the fame as what enfues from collections of water ; but the fwelling itfelf is much more tenfe than the other, and affords to the touch and preffure nearly the fame fenfation as is received from a bladder filled with air.

In a great proportion of cafes of tympanites, the air after death is found in the inteftines ; which, in fome inftances, have been inflated to a moft enormous fize. This I fuppofe to proceed from the inteftines lofing their tone ; but there is another variety of the difeafe, in which the air is diffused in the cavity of the peritonæum, in a fimilar manner to water in afcites. I have feen one inftance of this, and I have heard of another,

which happened lately in this place ; but in both, the air was found to have escaped from a small hole in one of the intestines. I am therefore inclined to believe, that this variety of tympanites very commonly proceeds from communication having taken place between the alimentary canal and the cavity of the peritonæum ; and therefore, that any remedies we can employ, must, where this is the case, be of no avail. But from whatever cause the disease may have arisen, and whether the air should be contained within the bowels themselves, or diffused in the cavity of the peritonæum, no doubt should be entertained of the propriety of discharging it, as soon as it appears to have brought the life of the patient into danger.

This may be easily done in the very manner I have directed for ascites ; taking care to use a trocar of the smallest size, and to employ pressure in the same guarded manner as when the tumor is formed by water. For, as the air will by its pressure produce nearly the same effects upon the neighbouring parts as we find to arise from water, it is equally necessary to employ such a degree of compression after it is discharged as will obviate the effects of abstracting it. To perforate the abdomen for air collected in the intestines, is no doubt a very formidable operation, and ought not to be attempted but in cases of the greatest danger ; but as death has often ensued from this variety of the disease, and of which I have met with different instances, I am clearly of opinion, when the remedies prescribed by the physician for removing it have failed, that the assistance of surgery should always be desired, rather than allow the patients to die in certain misery. The same remedy is frequently and successfully employed for discharging air collected in the stomach and bowels of other animals : we have much reason, therefore, to hope, that in the human species the same effects would result from it.

After the operation of tapping, whether in ascites or collections of air, we are commonly advised to rub

the abdomen from time to time with astringent spirituous applications. This can never do harm : it may sometimes serve to restore the tone of the integuments, and as the friction employed in it may tend to promote absorption, it ought never to be omitted. For the first two days after the operation, it cannot be employed, as during that period the bandage ought not to be removed : but this being elapsed, the bandage may be removed daily for about a quarter of an hour at once, for the purpose of rubbing the abdomen with camphorated spirit of wine, or volatile liniment ; care being taken to preserve the body during the time of it in a horizontal posture, and to renew the application of the bandage as soon as the friction is over.

CHAPTER XXIII.

OF HERNIÆ.

SECTION I.

Of Herniæ in general.

THE term hernia might with propriety be applied to every swelling produced by the dislodgement of parts from those boundaries within which in a state of health they are contained ; but the term in its general acceptation, implies, a tumor produced by the protrusion of parts from the cavity of the abdomen.

The parts in which herniæ usually appear, are the groin, scrotum, labia pudendi, the upper and fore part of the thigh, the umbilicus, and different points between the interstices of the abdominal muscles.

If the situation of these tumors is various, the viscera which they contain are still more so. Instances have occurred of the stomach, uterus, liver, spleen, and bladder, being found in them. But they most frequently contain a portion of the omentum or alimentary canal, and in some instances a portion of both.

From the situation and contents of herniæ, all the appellations are derived by which this kind of tumor is distinguished. Thus herniæ are termed inguinal, scrotal, femoral, umbilical, and ventral, from their appearing in the groin, scrotum, thigh, navel, or belly. When confined to the groin, a hernia is said to be incomplete, and is termed bubonocoele ; but, when the tumor reaches to the bottom of the scrotum, the rupture is then supposed to be complete, and the disease obtains the name of scrotal rupture, or oscheocoele.

When a portion of gut alone forms the tumor, it is called an enterocele, or intestinal hernia ; when a piece of omentum only has got down, it is termed epiplocele, or omental hernia ; and if both intestine and omentum are down, it is called an entero epiplocele, or compound rupture.

As all the abdominal viscera are apparently contained within the cavity of the peritonæum, and as it was judged to be impossible for that membrane to admit of such a degree of distention, as to surround tumors containing such large portions of the viscera as are sometimes pushed out, it was till of late imagined, that, at least in a great proportion of cases, the peritonæum is burst or ruptured ; and from this the term rupture seems to have been adopted : the opinion was farther confirmed, from its being observed, that in scrotal hernia, the protruded viscera were in some instances found in contact with the testicle ; a circumstance, which it was supposed could not happen, if the peritonæum had not been previously ruptured.

Since the anatomy of these parts, however, was better understood, this circumstance, of parts protruded from the abdomen being in some instances found in contact with the testicle, is explained in a more satisfactory manner than on the supposition of a rupture of the peritonæum ; and as the nature of herniæ will be better understood by an anatomical description being premised of the parts concerned in their production, I shall, before proceeding farther, endeavour to describe them : the parts chiefly concerned in herniæ, are, the abdominal muscles ; the peritonæum ; testicles, and spermatic vessels.

The sides and other fleshy boundaries of the abdomen are formed by five pair of muscles ; the recti, pyramidales, transversales, obliqui interni, and obliqui externi.

In some subjects, the pyramidales are wanting ; and as the obliqui externi are those which in hernia are

most connected with the disease, I shall here describe these only.

The *obliqui externi* are two thin, broad muscles : on their posterior and upper parts they are fleshy ; and tendinous on their anterior and lower parts. They originate from the eighth, ninth, and inferior ribs, by fleshy portions which intermix in a serrated manner with corresponding parts of the *latissimus dorsi*, *serratus major anticus*, *pectoralis major*, and *intercostales* : and afterwards becoming tendinous ; they form the greatest part of all the anterior surface of the abdomen, and are inserted into the *linea alba*, the spine of the *os ilium*, and the *os pubis*. On each side of the under part of the abdomen immediately above the pubes, two openings are met with in these tendons, intended for the passage of the spermatic vessels in men, and for the ligaments of the womb in women. These openings, or rings as they are termed, which seem to be formed merely by a separation of the fibres of the tendon from one another, are of an oval figure, and have an oblique direction from the spine of the *ilium* downwards ; they are somewhat wider above than below, and are rather of a larger size in men than in women.

Although these rings or openings have been commonly described as passing through not only the external oblique, but the transversales and internal oblique muscles also ; yet we now certainly know, that it is in the tendinous parts of the external oblique muscle only, that any such opening exists. It is of some importance to be thoroughly acquainted with this ; for, by the accounts received of it from books, we are led to suppose, that, instead of one distinct passage, there are always three. These muscles are likewise perforated in the middle by the umbilicus, which affords a passage for the connecting vessels between the mother and uterine fetus, and which is so far continued through life, that the space is filled up with cellular substance only.

From the inferior border of the tendinous part of the external oblique muscle, a detachment of fibres is sent off, which, after affording a firm covering to the inguinal glands, are lost in the fascia lata of the thigh; and the under edge of this tendon being folded inwards, obtains the appearance of a ligament, which stretches from the forepart of the os ilium to the pubes, forming a kind of arch, through which the great blood vessels of the lower extremity pass to the thigh. It is this ligamentous like portion of the external oblique muscle, that is known by the appellation of the ligament of Poupart or Fallopius.

This passage for the blood vessels of the thigh, being larger in women than in men, owing to the greater size of the pelvis in the former, by which the arch formed by Poupart's ligament is rendered both longer and wider; so in women the crural hernia, or that variety of the disease formed by a protrusion of parts through this passage, is more frequent than in men.

The internal surface of the muscles of the abdomen, together with every other part of that cavity, is lined with a smooth somewhat elastic membrane, termed peritonæum. This membrane, besides lining the cavity of the belly, furnishes the external covering to almost all the viscera contained in it; but, in so singular a manner are these coverings produced, that although at first sight the different viscera appear all to be contained within the cavity of the peritonæum, yet on minute examination they are in reality found to lie behind it.

The peritonæum, after having completely lined the cavity of the abdomen, is continued or reflected over all the viscera, so as to give an external covering to each. After surrounding one of the viscera, it stretches along to the most contiguous, forming in its course the supporting membranous ligament of the liver, and other viscera; and affording in its duplicature a kind of support or connection to the various blood vessels, as they stretch along to their destined situations in the intestinal canal and other organs.

Behind the peritonæum there is a quantity of loose cellular substance, by authors commonly termed its appendix. In some parts this substance is filled with fat; and in others it is empty, and can easily be filled with air.

The testes in the fetus, till near the period of delivery, are lodged in the cavity of the abdomen, in the same manner with the rest of the abdominal viscera. They are situated immediately below the kidneys, on the forepart of the psoæ muscles, near to the upper end and by the side of the rectum, where their external covering adheres by its posterior surface to those parts of the peritonæum on which they rest, while all their anterior and lateral surfaces lie loose in the abdominal cavity in contact with the other viscera. Even in this situation, however, a connection takes place between the testes and scrotum. This is formed by means of a substance that runs down from the under end of the testis to the scrotum, forming a kind of pyramidal shaped ligament; its large bulbous head being fixed to the lower end of the testis and epididymis; and its under extremity, after having passed through the ring in the external oblique muscle, being lost in the cellular membrane of the scrotum. This ligament is evidently vascular and fibrous, and seems in part to be composed of the cremaster muscle turned inwards.*

All that portion of the ligament contained within the parietes of the abdomen passes behind the peritonæum, and receives a covering from it in the same manner with the testes and other viscera: the peritonæum even gives a coat to a portion of the ligament after it has got into the groin, by passing down along with it from the abdomen into the upper part of the inguen.

At this place, viz. at the annular opening of the external oblique muscle, the peritonæum is very loose; and when the ligament and scrotum are drawn down-

* See a very accurate account of the Anatomy of these parts by Mr. J. Hunter, in Dr. Hunter's Medical Commentaries.

wards, an aperture is observed from the cavity of the abdomen all around the forepart of the ligament, that seems ready to receive the testis; and this aperture gradually becomes larger as the testis descends behind the peritonæum in its way to the scrotum. While the testicle is ready to descend, it does not fall down, as has been commonly imagined, along the forepart of the peritonæum, between it and the other viscera; but the ligament I have described, as lying behind the peritonæum, and connected with the testis at its under and posterior parts, by directing or pulling it down as it were, from behind, brings it in this manner along the psoas muscle between it and the peritonæum; and that part of this membrane to which I have shown that the testicle adheres, being necessarily drawn along with it, a kind of pouch or bag somewhat resembling the finger of a glove, is thus formed by this elongation of the peritonæum; the under extremity of which still continues to surround the testis as it goes along, in the same manner as it did while the testicle rested upon the psoas muscle; and the entrance from the abdomen to the cavity of this process, is exactly at that point where the testis was originally situated; for it is there that this process commences when the testis begins to descend.

The peritonæum being in a fetus remarkably lax and dilatable at this part, and being connected posteriorly, as we have seen, with a quantity of loose cellular substance, its elongation produced by the descent of the testicle is in this manner provided for by nature, and of course is easily admitted of.

It must not, however, be supposed, that the testis and peritonæum in coming down fall loosely and without connection; for, as they slide down very slowly, they still continue to adhere to the parts lying behind them, as they did when in the abdomen.

The precise time at which the testis passes down from its original situation in the abdomen, cannot be ascertained; but in general, this change takes place about the eighth month. About this period, the testis, surround-

ed with the peritoneal process, moves downwards, till its under extremity comes in contact with the most inferior point of the abdominal parietes; and by this time the passage through the tendon of the external oblique muscle is found much enlarged, by the ligament of the testis having sunk downwards so as to dilate it.

After the testis has passed the tendon of the muscle, it commonly remains for some time by the side of the penis, and by degrees only descends to the bottom of the scrotum; and even when it has got entirely into the scrotum, its ligament is still connected with it, and lies immediately under it, but is shortened and compressed.

The process of the peritonæum, which appears to descend with the testicle, continues to cover it when it has reached the scrotum: it is this loose covering or bag, which is afterwards converted into what anatomists term the tunica vaginalis testis; and from the description which I have given of it, it is evident, that the cavity of this bag must at first communicate with the great peritoneal cavity of the abdomen. This it accordingly does, as a probe may be passed readily and easily along this process or bag, from the belly down to the bottom of the scrotum; and if laid open through its whole length on the forepart, it will be plainly seen to be a continuation of the peritonæum; the testis and epididymis will be found at the lower part of it without their loose coat the tunica vaginalis; and as the spermatic vessels and vas deferens, while the testicle remained in the abdomen, entered the body of that gland behind, and between the reflected lamina of the peritonæum, so here, when in the scrotum, they will be found covered by the posterior part of the bag, in their whole course from the commencement of that process down the groin to the testicle.

This passage from the cavity of the abdomen to the scrotum is in general very soon cut off, by a firm adhesion taking place between the sides of the peritoneal process at its upper extremity where it descends from the abdomen. What the cause of this adhesion may be

is uncertain ; perhaps it may proceed from some slight degree of inflammation being excited upon the contiguous parts by the forcible passage of the testis ; but whatever the cause may be, the fact is, that at the time of birth this passage in general is completely obliterated.*

It is in the neck only, however, or in the superior part of this process, that this adhesion takes place : the lower extremity of the sac remains open and loose through life, and forms as I have already observed, the tunica vaginalis testis, the common seat of a hydrocele.

If attention is given to this description, it must appear, that if immediately upon the testicle descending from the abdomen, and before the passage is sufficiently contracted, any portion of the alimentary canal or omentum should likewise fall into the opening, such parts must for certain lodge in the same bag or covering with the testis itself ; and as long as they remain there, that they must effectually prevent the usual obliteration of the passage from being accomplished.

It is this occurrence, of a portion of some of the abdominal viscera getting into the tunica vaginalis testis, which forms that species of hernia to which new born infants are liable, termed *hernia congenita*. The testicle and protruded intestine being here in contact, the tunica vaginalis testis forms the hernial sac.

If the gut, or other parts which have fallen down, are again pushed into the abdomen, and retained there by a truss, the passage soon fills up, and no return of hernia takes place. But if this is neglected, and the gut allowed to remain long down, the parts forming the passage seem thereby to lose that power of adhesion which naturally they are known to possess ; instances being often met with where no art is able to produce this wished for obliteration.

The *hernia congenita* is usually produced in the manner I have described : I believe, however, that it

* The descent of the testes from the abdomen is a phenomenon very difficult to account for, and its immediate cause may probably always remain a mystery ; but their being in almost every instance found in the scrotum before birth, is a clear proof of their not being forced down by the effects of respiration, as has been commonly supposed.

may happen, and I think I have seen instances of its doing so, from this passage between the abdomen and testicle, after having been once closed, being again rendered pervious, in consequence of the parts being overstretched by those violent fits of coughing, crying and other convulsive affections to which children soon after birth are liable. The intestinal canal and other viscera, being pushed with violence against the containing parts, these will most easily give way that are the least firm, and this will most probably be the case with those that have been most recently united. In this manner, it is probable that a great proportion of those herniæ are produced which happen in early infancy; and I am inclined to think, that even in more advanced stages of life, the same variety of hernia may occur from the same cause.

It is evident then, in what manner the hernia congenita is produced: we shall now inquire into the causes of hernia in its more usual form.

I. The containing parts of the abdomen are elastic and compressible; whatever, therefore, tends by compression or otherwise to lessen the cavity of the abdomen, must occasion a proportional risk of some of the contained parts being pushed from their natural situations. The abdominal muscles and diaphragm are excited to severe contraction, by various causes, particularly by violent coughing, crying, laughing, and severe bodily exertion; and as the contraction of these muscles must always lessen the abdominal cavity, these causes therefore are frequently productive of hernia.

II. Falls, in consequence of the derangement which they produce in the abdominal viscera, from the sudden and violent shock with which they are often attended, are not unfrequently the immediate causes of hernia.

III. Persons of a preternatural laxity of frame, are very liable to hernia. The containing parts of the abdomen, from the want of sufficient tone and firmness, are unable in such people to resist the weight of the different viscera: they are therefore more particu-

larly liable to hernia on the application of any of those causes that usually give rise to it.

IV. Sprains are apt to induce a laxity of the injured part; and have therefore a similar influence in inducing hernia, with general laxity.

V. It has been observed, in those countries where oil is much used as an article of food, that the people are particularly liable to herniæ. In confirmation of which I may remark, that all who have attended the hospitals in France, where much oil is used, and where hernia is one of the most prevailing diseases, are astonished to find that it is not frequent in the hospitals of London and Edinburgh: one foreigner in particular remarked to me, that in a single hospital in Paris, the operation for strangulated herniæ during his residence there had been performed upwards of a hundred times in one year, while in some of the largest hospitals of London, it was only performed twice during the same period, and in eight or nine months here he had only seen it once.

In whatever parts the parietes of the abdomen are weakest, these various causes will most readily operate in producing herniæ; and accordingly we find, that descents of the bowels usually occur only in such parts.

The parts which from anatomy we would *à priori* suspect to be most liable to herniæ, are, the openings already described in the external oblique muscles; the arch formed by Poupart's ligament for the passage of the great blood vessels of the thigh; and the umbilicus, where the same firmness does not take place as in the rest of the tendinous expansion of the abdominal muscles.

These, as I have already observed, are the usual seats of hernia; but it sometimes happens, that parts of the viscera are protruded between the interstices of the different muscles of the abdomen: this, however, is not frequent.

In whatever part a descent of any portion of intestines occurs, except in hernia congenita, as all the vis-

cera are contained in the manner already described, within the peritonæum, a portion of that membrane, it is evident, must be carried down along with the parts that are protruded; and in every such instance, it is this portion of the peritonæum going down along with the gut that is termed the hernial sac. The size and thickness of this sac is various in different subjects, and in different stages of the same disease.

On the first appearance of hernia, the sac is commonly small, for the protrusion seldom becomes large at once; but by repeated descents of the bowels, the sac is pushed lower and lower, till in some instances its bulk is very considerable indeed; and when in this advanced period of hernia the sac is laid open, it is found to contain either large quantities of omentum, or intestine, and frequently large portions of both.

As the peritonæum has this property in common with other parts of the body, of thickening according to the degree of gradual extension applied to it, so the thickness and firmness of the hernial sac is often surprisingly great, a circumstance which every operator should keep in view.

Although every instance of any portion of intestine protruded from its natural situation, is to be considered as a derangement, and as such demands our attention, yet daily instances occur, both of recent herniæ, and of those of longer duration, from which no bad symptoms ensue. Thus we often meet with large hernial swellings, without the patient suffering in any other manner, than from the inconvenience arising from the bulk of the tumor. In general, however, it is otherwise; and troublesome symptoms most frequently take place; but whether they do or not, when the reduction of a hernia can be accomplished, it ought always to be done as quickly as possible.

All the bad symptoms arising from hernia, proceed either from obstruction to the passage of the feces when the intestinal canal forms the tumor, or from a stoppage of circulation occasioned by stricture on the

prolapsed parts ; so that the danger of the attending symptoms, it is evident, will always in a great measure depend on the nature and importance of the parts that are protruded.

Thus, when a portion of omentum alone forms the substance of a hernial swelling, as that organ is not so immediately necessary to life as many of the other viscera, it is not so frequently productive of danger, as when a part of the alimentary canal is either protruded by itself, or along with the omentum.

Although this, however, is in general the case ; yet it sometimes happens, that even an omental rupture is attended with danger. When the stricture is so complete, as to put a stop to the circulation in the protruded part, mortification, with all its bad consequences, must ensue. And besides, the connection between the omentum, stomach, and other viscera, is such that a sudden descent of any considerable portion even of omentum, is apt to bring on vomiting, hickup, and other symptoms of distress. And, lastly, although a rupture containing omentum only, might not of itself prove hazardous ; yet as the passage through which the omentum has slipped, must remain open as long as the protrusion continues, and as this must render it easy for a portion of gut likewise to get down, this of itself is a sufficient reason for bestowing even upon an omental hernia our most serious attention.

But whatever the contents of *herniæ* may be, whenever stricture occurs on them, sufficient to produce either a stoppage of the circulation, or of the fecal contents of the alimentary canal when a portion of gut forms the disease, the following in general are the symptoms that take place.

An elastic colourless swelling is observed at the part affected ; a slight pain is felt, not only in the tumor itself, but, if part of the alimentary canal is down, an universal uneasiness is perceived over the whole abdomen, and the pain is always rendered worse by coughing, sneezing, or any violent exertion. The patient

complains of nausea ; an inclination to retch ; he can get no discharge by stool ; he becomes hot and restless ; and the pulse is commonly hard and quick.

If the swelling is entirely formed by a portion of gut, and if no feces are contained in it, it has a smooth, equal surface ; and although easily compressible, it instantly returns to its former size on the pressure being removed. But, in gut ruptures of long duration, where hard feces have collected in the protruded bowels, firm inequalities very commonly take place.

When again the tumor is composed both of gut and omentum, its appearance is always unequal : it feels soft and somewhat like dough, nor is it so elastic as when part of the intestinal tube only is down ; for although like the other it is compressible, it does not so readily regain its former dimensions on the pressure being taken off.

It has been a received opinion, that in strangulated hernia, the symptoms should be less violent when the intestine is accompanied with a portion of omentum, than when the gut alone is down. Little or no difference, however, occurs from this ; for when the gut becomes obstructed and inflamed, the symptoms which ensue are nearly the same whether the omentum is down or not.

It will readily, however, be supposed, that the symptoms described above, can never take place from the presence of omentum only ; for although stricture produced on a portion of omentum, even when no part of the intestinal tube is down, may excite much distress, such as pain, sickness, vomiting, and twitching pains through the whole belly ; yet no obstruction of the gut ever occurs from it, and of course none of the symptoms ever prove so alarming as when any part of the gut is concerned.

If the symptoms arising from a strangulated gut, are not soon obviated by the stricture being removed, the nausea and retching terminate in frequent vomitings, first of a bilious, and afterwards of a more fetid

matter ; the belly becomes tense ; the pain more violent ; a distressful convulsive hickup takes place ; the fever, which at first was of little importance, begins to increase ; the patient is all along exceedingly restless, and continues in a disagreeable state of anxiety through the whole course of the disease.

These symptoms having for some time gone on with violence, the patient is apt at last to be suddenly relieved from pain, when he flatters himself that every risk is at an end ; but instead of this, the pulse, from being hard and frequent, becomes languid and interrupted ; cold sweats break out over the whole body, and especially on the extremities ; the eyes become dull and languid ; the tension of the abdomen subsides, and the tumor in part disappears ; the skin covering the tumors, which before was either of a natural appearance, or red and inflamed, now becomes livid, and a windy crepitous feel is distinguished in the substance of the tumor.

If the protruded parts have not of themselves gone entirely up, their return is now in general easily effected with gentle pressure, and the patient then discharges freely by stool ; but the cold sweats increasing, the hickup turns more violent, and death itself is at last ushered in by its usual forerunners, subfultus tendinum, and other convulsions.

These are the ordinary symptoms of what is termed a strangulated or incarcerated gut rupture ; that is, when the parts protruded become so affected by stricture, as to produce pain ; and do not either return to their natural situation on the patient getting into a horizontal posture, or cannot be replaced by the hands of a practitioner.

In whatever situation a strangulated hernia may occur, our only rational method of cure must consist in the removal of that stricture by which the return of the protruded parts is prevented. It is this that we are to consider as the cause of the mischief ; and un-

less it is completely removed, nothing effectual can be done for the relief of the patient.

Various methods have been proposed for the removal of these strictures ; all of them, however, may be comprehended under two general heads.

I. Such as tend to the reduction of the protruded parts, without the interposition of any chirurgical operation usually so called ; and,

II. A division of the parts producing the stricture, so as to admit of a replacement of the deranged viscera, constituting what in general is termed the operation for the hernia.

The remedies to be employed for the first of these, are, a proper posture of the patient, with the manual assistance of a practitioner ; bloodletting ; stimulating glysters ; opiates ; the warm bath ; and proper applications to the tumor itself.

As soon as a practitioner is called, the first circumstance requiring his attention, is, the posture of his patient, which ought to be such as will most readily favour the return of the protruded parts. Thus, when the tumor is in the groin, or in the forepart of the thigh, the patient should be so placed, as to raise his thighs and legs considerably higher than his head and trunk ; that is, he should be placed nearly perpendicularly upon his head.

This position causes almost the whole quantity of intestines to hang or swing by the protruded parts, and it frequently proves a means of reducing them : placing the patient's feet over the shoulders of another person, while his body is allowed to hang downwards, and causing him in this posture to be jolted about, has in some instances answered when every other means have been tried in vain.

For the same reason that in the inguinal and femoral hernia this position is more advisable than any other, the usual erect posture of the body becomes most proper in cases of exomphalus or umbilical rupture ; and again, a horizontal posture is most likely to prove useful in ventral hernia.

While the patient is thus placed in the most suitable posture, the surgeon should endeavour to assist the return of the protruded parts, by gentle pressure with his hands and fingers. In the inguinal or scrotal hernia, the pressure should be made obliquely upwards towards the os ileum, so as to correspond as nearly as possible with the opening in the external oblique muscle. In the femoral hernia, the pressure should be directly upwards; in the umbilical hernia, downwards and backwards; and in the ventral hernia, directly backwards.

In herniæ of any considerable size, pressure is most conveniently made, by grasping the swelling with one hand from the bottom upwards, while with the fingers of the other we endeavour to push forward the contents at the superior part of the tumor. Some surgeons, in pushing forward the intestine, employ the fingers of both hands at the upper part of the tumor; but the same purpose is answered equally well with the index and middle finger of one hand, while the other is employed with advantage in pressing the under part of the tumor upwards so as to co-operate in this manner in the reduction. It is this operation which by authors is termed the *taxis*. No description, however, can convey an adequate idea of the manner in which it should be performed: for, like many other points in the art of surgery, a knowledge of it can only be obtained from experience and observation: but this must always be had in view, that any pressure we employ should be of the most gentle kind; for whatever creates much pain, proves prejudicial, and ought to be avoided.

In attempting to reduce the contents of herniæ, so much force is often employed, and in such a rough manner, as can scarcely fail to injure the protruded parts: nor is the risk, that ensues from this, ever compensated by the practice proving more successful; for where a proper application of gentle pressure does not answer, we never succeed with much force.

If moderate pressure, therefore, does not soon prove effectual, other means should be immediately advised. Bloodletting is here to be considered as a principal remedy; for in no disease does it afford more relief. The quantity to be taken must in a great measure depend on the strength of the patient: but if in any case we can with propriety venture upon abstracting large quantities of blood from weakly patients it is here; and we often perceive with surprise to what length it may be carried without hurting the system. A state of deliquium being known to produce more complete relaxation of all the muscular parts of the body, than can be obtained in any other way, it has sometimes been advised, in the treatment of hernia, to take off such large quantities of blood, and in such a sudden manner, as to excite fainting; and the practice has in some instances proved effectual.

As obstinate costiveness is commonly one of the most alarming symptoms of hernia, it has been the prevailing practice to prescribe not only stimulating purgatives by the mouth, but injections of the most acrid kind. In judging, however, from experience, I would say, that the practice should not be adopted; for when it does not prove useful, it very universally does harm, by increasing the sickness at stomach which always prevails here, while at the same time it adds to the pain and tension of the tumor. I am clearly, therefore, of opinion, that remedies of this class should not be pushed so far as is commonly done; and instead of purgatives by the mouth, I would recommend injections of tobacco smoke. A variety of machines have been invented for injecting smoke by the anus; but none answer the purpose so well as the instruments represented in Plates LXIII. and LXIV. They are easily procured; and by means of either of them, smoke may be injected with any necessary force.

I would not have it supposed, however, that I recommend tobacco smoke used in this manner as an infallible purgative, as many have done. For the con-

trary is certainly the case: I have known it used in various instances, both of hernia and ileus, and not often with advantage. I only advise it as the most effectual remedy of this class with which I am acquainted; and I know that this mode of injecting it, is the most effectual hitherto invented. It has been objected to the instruments I have delineated, that we cannot by means of them ascertain the quantity of smoke we inject. But this is a nicety of little importance; as the rule in all such cases should be, to continue to throw up the smoke, either till it has produced the wished for effect; till a considerable degree of sickness is induced; or till the abdomen is found to be distended, for which in some patients much more is required than is found to answer in others.

But although this remedy does not frequently answer as a purgative, it proves often useful as an anodyne both in hernia and ileus. And as we are often in such cases deprived of the advantage of opium, by the stomach not being able to retain it, we may occasionally, in severe degrees of pain, have recourse to glysters of tobacco smoke, as one of the best means of procuring ease.

Among the list of purgatives employed in herniæ, acrid suppositories, composed of soap, aloes, and other stimulating materials, have been much recommended; and when remedies of this class are to be used, these may be considered as a necessary addition to the others; but no great dependence should ever be placed on them.

We are told, indeed, that in some cases of hernia, drastic purgatives have been of advantage; but I have so frequently known them do harm, by increasing the nausea, pain, and inflammation of the strangulated gut, that I am under no difficulty in saying that they ought never to be used.

Opiates prove often useful, not only by relieving pain, but as tending to relax those parts which, by being preternaturally constricted, we consider as the principal seat of the disease. I have already observed,

however, that the retching which takes place in most cases of hernia, prevents the exhibition of opiates by the mouth ; but in such instances they may be applied with advantage in the form of injection, and their use may be alternated with injections of tobacco smoke, as I have already pointed out.

Warm bathing is another remedy from which much advantage has been derived in the treatment of herniæ : not the local application of heat, however, as conveyed in the form of poultices and fomentations, but the universal warm bath, in which the whole body is immersed, and which we know to be possessed of very relaxing powers.

Immersing the whole body in a warm bath, by tending to relax the constriction on the protruded intestines, may prove useful by promoting their replacement ; but the local application of heat to the swelled parts, although commonly advised, is very apt to do harm. On the constricted tendon it can have no influence, for it lies so deep as to be little affected by remedies of this kind. And as the heat conveyed in this manner must tend to rarefy the contents of the tumors, and must thus increase the bulk, instead of answering any good purpose, on this principle it is evident they must do harm ; and accordingly, whoever will attentively observe their effects, will find that they do so. When the external teguments are much inflamed and painful, by their emollient properties, they may afford relief ; but the ease thus obtained proves only momentary, as the pain commonly soon becomes more severe than it was before.

Whoever attentively considers the nature of hernia, and the means that prove most effectual in the cure, must be of opinion, that all the bad symptoms that appear in it, arise from stricture produced upon the protruded parts. By some, however, a different opinion has been held forth, and all these symptoms have been imputed to spasm or inflammation in the protruded

parts themselves, independent of stricture or any other affection of the parts through which they have passed.

That inflammation of the prolapsed bowels, in whatever way it may be induced, will in general terminate in all the symptoms of strangulated hernia, no person will doubt; but that stricture in the tendons, through which the bowels have passed, is the most frequent cause of this inflammation, is also obvious. Admitting however that the cause of all the bad symptoms in hernia should originate in the parts that have been protruded, and that they are not induced by the opening through which they have passed, being lessened by stricture, still the application of heat to this kind of tumor must be improper, as the rarefaction which it excites, by giving an increased bulk, must necessarily increase the danger.

While we might, *à priori*, be warranted to argue in this manner, I can from practice and experience assert, that we derive more advantage from the external application of cold than I have ever perceived from any other remedy. In various instances I have applied ice and snow with much advantage, and I never saw them do harm.* But in general, the remedies upon which I depend are cold saturnine solutions, and cloths kept constantly moist with a mixture of cold water, vinegar and brandy.

By these remedies alone we sometimes succeed, without further assistance: but it frequently happens, notwithstanding every attempt, that the protruded parts cannot be returned; the symptoms, instead of abating, become more violent; and the event of the disease becomes of course more doubtful.

In this situation, we should again endeavour to return the contents of the tumor, by a proper application of pressure with the hand, assisted with due atten-

* By some writers, this practice has been considered as hazardous; but I find it recommended by others to whom much credit is due, particularly by the late Dr. Monro. See his works, 4to. edition, p. 559:

tion to the posture of the patient ; but where this does not soon prove successful, the division of the parts by which the stricture is produced should be advised as our only resource.

This, it may be remarked, is one of the most important points on which a surgeon has ever to decide : I mean the exact period at which the treatment of hernia, by means such as I have pointed out, should be laid aside, and the operation be put in practice. If a surgeon, without having given a full trial to all the usual remedies, should early proceed to the operation, and if unfortunately it should not succeed, he would probably be blamed by the friends of the patient as the principal cause of his death ; and again, even allowing a recovery to be obtained by the operation, he is apt to be blamed, not only by his brethren of the profession, but by the patient himself, for having made him suffer an unnecessary degree of pain.

In such circumstances, a practitioner is very apt to feel himself embarrassed. But we ought here, as in every critical situation, to be entirely directed by experience ; and if this rule was kept in view, instead of the usual delays in almost every instance of strangulated gut, we would advise the operation at a more early period.

The operation of the hernia is no doubt liable to some hazard ; but the danger attending it has by many been magnified more than it ought to be ; for, so far as I can judge from experience, the risk from the operation being long delayed, is infinitely greater than from the operation considered abstractedly.

Were we able, from the symptoms, to determine the exact period at which the operation should be performed, no kind of difficulty would occur from it ; but this is so far from being the case, that the most experienced surgeons seldom agree on it. In some instances, hernia, with every symptom of strangulation, continues for six, eight, or ten days ; and after all, the protruded parts are replaced, and the patient does

well : and in many similar cases when the operation has afterwards been found necessary, although the severest symptoms may have subsisted for several days, yet, on laying the parts open, no appearances either of inflammation or gangrene have been discovered.

With others, again, the same set of symptoms, with perhaps no more tension in the tumor, prove quickly fatal. In some of these, the rapid progress of the disease is often astonishing ; the space of forty-eight hours hardly intervening, from the first attack till the death of the patient : I have even known the intestines become perfectly gangrenous in the course of one day from the time of their first expulsion.

Every practitioner of experience knows, that this is the state of the question ; and if so, it must at once be obvious, that long delays must in such critical circumstances be always hazardous ; and as the danger from the operation itself, is trifling when compared with the risk accruing from delays, it ought, I think, to be an established maxim, to proceed in every instance to the operation, if in the space of a short time bloodletting and the other remedies that I have mentioned, or which happen to be used, do not prove effectual. Two or three hours at farthest, even when practitioners are early called in, is, perhaps, the greatest length of time that should be consumed in trials of this kind.

In the treatment of *herniæ*, it has been remarked, that the French surgeons prove usually more successful than German or British practitioners ; and so far as I know, no reason can be assigned for the difference ; but that the French proceed more early to the operation than the surgeons of almost any other nation. They will thereby, no doubt, perform it on some patients who might have recovered by more gentle means ; but any inconvenience arising from this to a few, is fully compensated by the number of lives that must be saved by having recourse to it in due time, which otherwise might probably have been lost.

Although for obvious reasons the reduction of the contents of herniæ should in every instance be attempted, yet cases often occur in which it cannot be accomplished.

When the reduction has once been completed, we have it in our power to prevent the disease from returning, by the constant application of a proper truss to the opening at which the parts were pushed out. But, from this being neglected, ruptures which might at first have been easily cured, come at last by repeated descents, and by the great quantity of parts that fall down, to form tumors of such magnitude, in proportion to the opening through which they were forced, that no art can replace them by the more simple means of reduction.

But besides this, such adhesions frequently take place, between the viscera forming the swelling and the surrounding parts, as render it impossible to return them by any other means than the operation. By this, indeed, perhaps every case of hernia may be reduced; but, however necessary this operation may be when a patient is in danger, as it is always attended with some hazard, it should seldom be advised where symptoms of strangulation do not actually exist.

In that indolent or chronic state of hernia we have just been describing, although by interested and ignorant practitioners the operation has been often proposed as a radical cure; yet surgeons of character would in such circumstances seldom advise it: they would rest satisfied with preventing any accumulation of feces in the intestines, by prescribing a proper diet, and the occasional use of gentle laxatives; and with obviating, by a suspensory bandage, any inconvenience that might arise from the weight of the tumor.

By these means alone, even the largest herniæ are often made easy and supportable for a great length of time; the circulation of the parts contained in the swelling goes freely on, as well as the peristaltic motion of such parts of the alimentary canal as are pro-

truded ; and hence it is, that we have many instances of large portions of the gut falling down even to the bottom of the scrotum, and continuing there for a great number of years, without giving any interruption to the usual discharge by stool.

In this state of the disease, therefore, the operation can seldom be admissible. But although people with hernia in this situation frequently enjoy good health, and sometimes feel little inconvenience from the tumor, yet it must not be supposed that their situation is free of danger : on the contrary, we often observe, that the disease, after subsisting in this state for a great length of time, will inflame and become painful, so as to excite every bad symptom commonly induced by real strangulation of a gut. As long, too, as the tumor continues, as the opening through which the parts have been pushed is thereby prevented from closing, so the patient still remains liable to descents of other portions of intestine which have not formerly been down, and by which the most fatal symptoms may be induced. But what I here wish to establish is, that, till once these bad symptoms actually occur, either from an affection of that part of the gut which has been long down, or of a portion more recently protruded, the operation for the hernia ought seldom to be advised. All that can here be done with propriety is, to fit the patients with proper suspensory bandages ; to warn them of the risk they will incur from laying them aside ; and to caution them against violent exercise, particularly leaping, and every sudden exertion.

Although with practitioners of reputation this circumstance cannot require much discussion, yet the public at large are much concerned in it. The former know, that the operation should be seldom performed in any case of hernia where violent symptoms do not actually exist ; but the latter, not being able to judge of the various circumstances to be taken into consideration, are too frequently imposed on by that numerous set of itinerants with which every coun-

try abounds. By these a variety of operations are put in practice for performing what they call a radical cure of ruptures; by which they mean to say, a prevention of future descents.

But as no remedy with which we are acquainted, a well adapted truss only excepted, can be depended on for this purpose; and as all the other means that have been advised for it, are not only painful, but highly dangerous, the magistracy of every community ought to interfere in suppressing them.

The object in view by all these attempts, is, either to destroy the hernial sac entirely, or to procure an accretion of its sides; which, by those who are ignorant of the anatomy of the parts concerned, has been considered as sufficient to prevent any return of the disease.

In order to effect a total destruction of the sac, our forefathers employed not only the knife, but the potential and even the actual cauteries; and with a view to produce a firm union of its sides, which was considered as equally effectual, it was afterwards proposed by practitioners of more tender feelings, to employ the needle, and ligature, or what was termed the royal stitch: and for the same purpose was invented the famous punctum aureum, which was performed in the following manner. After reducing the intestines into the abdomen, the sac was laid bare with a scalpel; and a piece of gold wire being passed round the upper end of it, the wire being likewise made to include the spermatic cord, it was then ordered to be twisted with forceps to such a degree of tightness as to prevent the descent of the gut, but not to interrupt the circulation in the spermatic cord.*

But none of these methods being found to answer, for even the actual cautery, although carried to the depth of the bone itself, does not secure the patient against a return of the disease, our modern pretenders

* For a more particular account of these various modes of practice in hernia as employed in former times, see the writings of Albucasis, Paulus Ægineta, Fab. ab Aquapendente, Hildanus, and Ambrose Parey.

have therefore ventured to improve upon the ignorance of ancient practitioners, and actually go the length of destroying, not only the hernial sac, but the testis also : without any knowledge of the anatomy of the parts, and having no reputation that can suffer by any consequences that ensue, they proceed without fear ; and, by promising all that patients can hope for, they are sure to be well received. In consequence of this, in every large town, many operations are performed by them ; numbers are accordingly mutilated, and many thereby even lose their lives. Their method of operating is shortly this : they lay bare the hernial sac, and having reduced the prolapsed parts, a strong ligature is passed round both the sac and spermatic cord, and drawn so tight as to destroy, not only the passage along the sac, but the cord itself, and of course the testicle. In some instances nothing further happens ; but in others, such a degree of inflammation is induced, as to terminate in the death of the patient.

If any of these means, however, were to produce the wished for effect, the prevention of future descents, the risk would in some measure be compensated by the advantage : but the fact is much otherwise ; for unless a truss is kept constantly applied, the patient continues liable to a return of the disease in nearly the same degree as if no operation had been performed. Even the operation for the hernia itself, does not, as has been supposed, fortify the parts against a return of the disease, the continued use of a truss being nearly as necessary after that operation as if it had not been performed.

In a few cases, the opening may be so completely closed by the inflammation induced by the operation, that no farther descents would take place ; but as I have known different instances of its failure, in which, from neglecting to wear a truss, the disease returned with the same symptoms of strangulation as before, I can without hesitation say that the principle should be adopted.

In Plate LXV. trusses are represented for different varieties of hernia. They are intended for the more usual forms of the disease, the inguinal, crural, and umbilical rupture. When others are wanted for particular parts, tradesmen in this line of business should be applied to, with directions to fit the instruments with the nicest exactness to the parts for which they are intended. Indeed, the advantages to be obtained from a truss, depend entirely on the exactness with which it is fitted; and nothing but the nicest attention can prevent it from doing more harm than good. The sole purpose of a truss is to prevent the parts newly replaced from falling down. If therefore the pad or bolster with which it is furnished does not bear properly against the opening upon which it is placed, a portion of gut may slip out, and be materially injured by the pressure of the pad. I have met with different instances of this, where bandages by not being exactly fitted did much harm, and every practitioner must have observed them: it is therefore a matter of the first importance, that tradesmen be made to pay the most exact attention to this. All rupture bandages should be of the steel spring kind; for those formed of linen and other soft materials, can never be kept properly applied. Even in infancy the steel truss may be made so light and easy as to be used with safety.

Having premised these general observations, which relate equally to every variety of hernia, I shall now proceed to consider more particularly the different forms of the disease.





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